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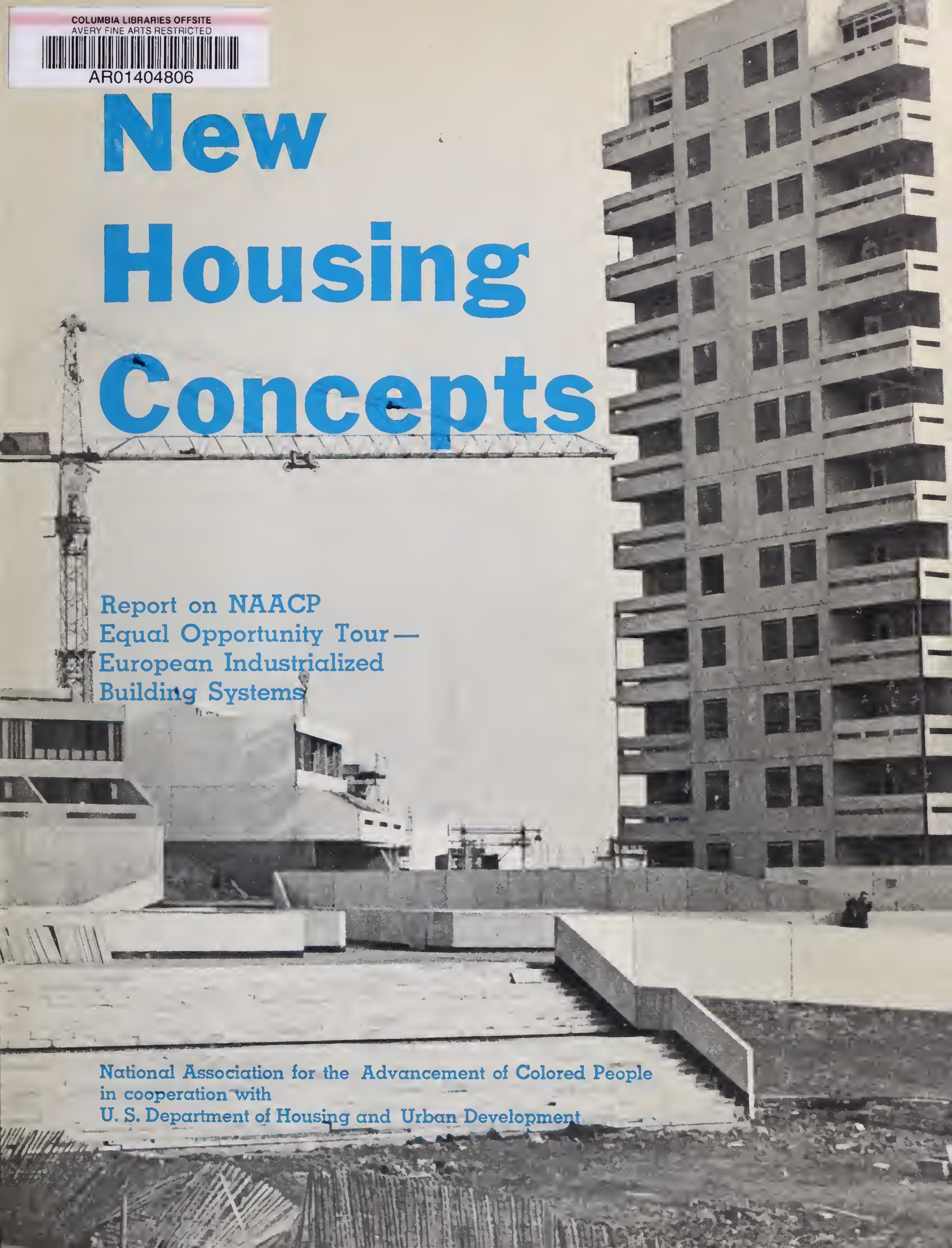
New Housing Concepts

Report on NAACP Equal Opportunity Tour— European Industrialized Building Systems



National Association for the Advancement of Colored People
in cooperation with
U. S. Department of Housing and Urban Development

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COVER: Deteriorated Baltimore, Maryland, housing has been placed in juxtaposition to a nearly completed segment of Thamesmead, a system-built new town in London, England. The NAACP's continuing concern with adequate housing and employment for Negroes, and other minorities, prompts the photographic contrast in the conviction that the industrialized building process offers a rapid means to rebuild urban slum areas and, simultaneously, to provide jobs and business opportunities to numerous unskilled men in the process.

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New Housing Concepts

Report on NAACP Equal Opportunity Tour — European Industrialized Building Systems

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New York
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Prepared under supervision of NAACP Department of Housing

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Publication date: December 1970

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An expression of gratitude is due Warren Marr, II, for editing and also for book layout and design, to **Engineering News-Record** for permission to reproduce illustrations of certain types of housing and, of course, to the Department of Housing and Urban Development whose Urban Renewal Demonstration Grant made the project financially possible. Further thanks go to William R. Morris for his preface and to John Coke and Maurice D. Brooks for their individual appendices.

For their cooperation with the NAACP in the sponsorship of the European Tour, gratitude is due the National Urban League, National Housing Producers Association and Black Economic Union. And to William Cammack appreciation is due for his effective handling of public relations for the tour which included contacts with all the communications media and with governments and their embassies.

Sponsors of the tour are indebted to the U. S. State Department and to American embassies and consulates in the cities visited for their courtesy in arranging receptions and in providing numerous facilities which added to the value of the trip.

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Preface

by William R. Morris, Tour Director
Director of Housing Programs
NAACP Special Contribution Fund

Representing all sections of the United States, some 120 persons from 23 states gathered on the evening of February 27, 1970, at John F. Kennedy International Airport in New York City. Few among these renewed old friendships but, for the most part, this was the initial meeting of housing experts who would share, until March 15, new experiences and introductions to new concepts in housing production and innovative community planning by touring industrialized housing sites in five Western European nations.

The tour group was composed predominantly of black men and women, but included white, Oriental and Spanish-speaking Americans. Included were architects, contractors, lawyers, financial experts and a variety of housing specialists, together with community-oriented leaders.

The National Association for the Advancement of Colored People had undertaken to organize this tour of foreign nations and their housing production processes. Why? What did the tour have to do with civil rights? What is this new thing called "systems building?" The explanation, together with some clearer knowledge of concepts, interrelationships and objectives, begins to evolve as we attempt to relate civil rights and social objectives to economic and production technologies in the field of housing. Such is the purpose of the report, "New Housing Concepts."

In the decades of the Fifties and the Sixties, America experienced compounded urban crises brought about not only by population booms and accelerated migration of the poor (largely black) to our cities, but also by rapidly deteriorating housing, living conditions and social values. Our nation's highly fragmented housing industry generally has excluded racial minorities from the production process and from free access to most of the supply of housing. Neither private industry nor the national government has been able to deal adequately with the growing demands of minorities for meaningful involvement.

Consequently, a major objective of The Equal Opportunity Tour was to increase the awareness among minorities that mass production methods and systems technology are capable of creating pioneering opportunities for them to become part of the economic mainstream as producers over and above the traditional role as consumers.

While unfamiliar to most people today, the term "systems building" will become a household word to most individuals in the Seventies. The concept of this method of producing housing has been condemned, praised, misunderstood and, sometimes, deliberately confused. However, one fact is inarguable. Housing is related to everyone — each of us will be affected by new trends in how, or in what, we live — how that dwelling is constructed, financed, planned, and what it will look like today and in the years ahead.

Systems for industrialized housing may be defined as "the integration of planning, designing, programming, manufacturing, site delivery and operations, and financing and management, into a disciplined method for creating housing."

The opposite is known as conventional building, where housing is produced largely on-site in a piece-by-piece operation by separate suppliers, sub-contractors, lenders, etc., all working on an individual (and ofttimes uncoordinated) basis. With the exception of mobile homes, systems building has made insignificant progress in the United States.

The launching of HUD's Operation Breakthrough in 1969 gave new impetus to systems development and increased public awareness of its adaptability. A rapidly growing new industry is now about to emerge with the increased support of government and private industry backing. The NAACP is making a concerted effort to assure that minority group needs are given a greater voice in the provision of housing and that minority entrepreneurs will have equal access to the new careers and economic benefits generated in the production of housing. These new opportunities range from ownership interest in systems, site and environmental planning, design of housing more suited to the life-style of minorities, management and engineering in the production process, to the full involvement in construction and maintenance operations.

With most building systems utilizing 70% to 90% unskilled workers and training programs of 30 days or less, we view mass production efforts as an additional opportunity to provide honorable and permanent employment to unemployed and underemployed inner city workers.

Tour members were exposed to many licensing opportunities by European systems producers. These included the provision of needed technical and financial assistance for local development teams formed with and by participants of the tour. As a result of this initial thrust, American systems producers quickly recognized the merit of forming relationships with minority housing interest groups and individuals. Such activity has accelerated minority participation from the 22 Operation Breakthrough award winners and resulted in other independent activities in New York, Baltimore, Newark, Memphis, Chicago and other cities.

The Institute of Industrialized Building Opportunities (IIBO) was formed in May 1970 by participants in the tour, most of whom felt that the momentum should be continued on an organized basis. National organizations represented on the tour have moved forward with special program efforts based upon a new awareness of the potential which systems building holds for the advancement of minority enterprise and more meaningful community involvement.

We hope that this report will serve to inform and stimulate those who administer housing programs and those who produce the housing that, given the opportunity, minority people have the capability and the interest in industrialized building systems to become full participants and to make an effective contribution in the rebuilding of America's rapidly deteriorating housing stock.

If we do not become a part of the solution to our greatest domestic crisis — housing, then we are inevitably going to remain a part of the problem. Upon our return to the United States there was a strong and overwhelming determination that we will not be left out again — that blacks must have a "piece of the action"!

The application of industrialized building know-how, as viewed in Europe's experience over the past 20 years, can be adapted to this nation's concept of housing; it also can serve to quickly rebuild inner city and urban renewal areas; it is readily adaptable to the development of new towns; and, because it is a new industry now emerging, it can overcome the housing industry's traditional practices of discrimination against minorities, and help to reform and standardize building codes. With the help of the civil rights movement, zoning laws, restrictive union practices, resistance of local officials and national commitments can be better dealt with. We can join forces with this new industry to become equal partners in progress and share fully in achieving the American dream of decent housing in a suitable living environment for all people.

(Above) Part of Equal Opportunity Tour group as it disembarked in Milan. (Below) One of the many press conferences involving organization leaders. Left to right: William Ross, HUD; William R. Morris, director of housing programs, NAACP, and tour leader; Glenn Claytor, housing director, National Urban League; Stanley Sumlin, business consultant to Black Economic Union; John Coke, systems consultant and technical director of tour.

■ Introduction

After months of intensive planning, more than 100 Americans representing U. S. minority groups, predominantly blacks, spent 17 days from February 27 to March 15, 1970, inspecting European industrialized housing systems and new towns. The tour, sponsored and directed by the Housing Department of the National Association for the Advancement of Colored People, marked the first time a minority group from the U. S. traveled to Europe to study, first hand, industrialized building techniques. Cooperating in this effort were the National Urban League, the Black Economic Union, and the National Housing Producers Association. The participants paid their own way and took two weeks of their own time, demonstrating a strong commitment to seek positive and innovative methods to help rebuild our cities and provide the housing we so desperately need, especially at the low- to moderate-income levels.

The group represented a broad cross section of professional skills — architects, planners, contractors, lawyers, bankers and financiers, engineers, developers, consultants, real estate brokers and managers, local public agency officials, educational and behavioral specialists as well as representatives of leading national and local organizations. They came from 23 states and 16 of our largest cities, representing a widespread geographical sampling of the U. S.

Tour members visited plants, erection sites and finished dwellings, and new towns, in Milan and near Amsterdam, Paris, London, and Stockholm. They talked with government authorities, private builders, and experts from housing institutes to get detailed knowledge of industrialized housing in the five countries. In each country, tour members were received at the U. S. embassies, where many prominent local and building leaders were invited to talk with them. In Paris, a large group of black Americans living in Paris made the group welcome.

The NAACP undertook the tour to provide entrepreneurs in the field of housing with new ways of moving into mass production and systems building operations in the U. S. The vast sums of money pumped into the housing industry and the related economic benefits and professional opportunities, generated in the production of housing, have, for the most part, bypassed economically disadvantaged minority groups. Until now, members of minority groups have been relegated largely to the role of consumers rather than producers.

The purpose of the tour was to determine how a rationalized industrial process for producing housing, one which has helped Europeans rebuild their cities since World War II, can be adapted to help meet the housing crisis in the U. S., mainly in the low- to middle-income market. As experts in their field, the members of the tour explored the opportunities for licensing, technical assistance, and financial assistance to mass produce housing to groups which include a representative number of minority groups on the decision-making level.

In the Housing and Urban Development Act of 1968, Congress reaffirmed as a national goal of the U. S., "a decent home in a suitable living environment for every

American family." Its 10-year goal is to produce 26 million dwelling units, of which six million are intended for low- and moderate-income families. Unfortunately, under the present fragmented housing industry, the U. S. is producing fewer than 1.5 million units a year. To meet our minimum housing needs, we will require an increase in production of an added 1 million units a year during the next decade.

The Department of Housing and Urban Development's 1970 goal is 425,000 new homes for lower income families and 500,000 in 1971. If achieved, this would more than double the production record of 1969, 175,000 units. By 1975, the U. S. will have to construct 3 million subsidized and nonsubsidized units a year. That means increasing the present $30 billion a year spent for housing to $60 billion by 1975.

One way to meet the housing challenge in the U. S. is to convert the traditional craft-oriented housing industry into a disciplined, streamlined, organized, mass production process which draws upon the untrained labor pool and upon those professionals sensitive to the needs of rapidly deteriorating cities. In order to do this, a company would gather under a single corporate management all of the functions now performed by separate technical, labor, and administrative entities of the building industry. Essentially, this is what systems or industrialized building is. It is a management technique that integrates marketing, design, manufacturing, site erection, financing, and administration into a rationalized method of production.

Production trends in the U. S. are shifting rapidly from single-family to multi-family dwellings, a fact which makes the mass production of housing more than feasible. Projected figures for 1970 new housing starts show 698,000 apartments to 695,000 single family dwellings. Based on recent production figures, the majority of the multi-family units, 525,000, is expected to be garden and townhouse apartments.

The advantages of factory methods for producing housing are manifold: use of about 75% to 85% unskilled labor; year-round production unaffected by weather; minimum site erection crew; substantial reduction in construction time; increased volume of production; and 5% to 10% decrease in cost under conventional construction in most European countries.

Minority entrepreneurs in the housing field see the industrialized building process as a means by which to enter the mainstream of economic life in the U. S. The process offers opportunities for disadvantaged blacks and other minority professionals to "get a piece of the housing action" while at the same time providing a vast new opportunity to train community residents for meaningful jobs. As the community gets involved in producing its own housing, the social and economic feedbacks will improve the quality of life for all of its residents and the general community.

The report will attempt to relate what the European experience in industrialized housing has been. It will start with a brief history and background of European industrialized building and a description of the systems and new towns visited by the tour.

It will discuss also the governments and institutions which influence systems development and will relate this information to the building industry in the U. S., including the constraints that have impeded mass production of quality housing.

As this report will evidence, tour members acquired considerable knowledge which will benefit not only minority groups, but anyone concerned with solving the housing problems in the U. S.

On the software side, they found:

- A strong governmental commitment to housing programs in most countries. For example, in Holland, almost 10% of the national budget is spent on housing, including government loans and subsidies to both the producer and the occupant, and land set aside to meet planned growth, as compared to about 2% in the U. S. for housing and community development.
- Extensive planning and development of new towns using industrialized building methods to cope with the problems of urbanization and to provide decent housing and an attractive environment for all income groups.
- Housing institutions which do both technological and sociological research aimed at improving the housing conditions for all income groups.
- Great progress toward performance codes that will allow the introduction of new and improved building materials and methods rather than perpetuation of codes based on special interest group requirements.
- A high degree of concentrated managerial experience in the housing field.
- The implementation of community planning affecting all income groups as part of a larger regional and national planning effort.

On the hardware side, tour members found:

- The application of mass production techniques in the production of housing.
- An increase in housing production based on high-speed component production and decreased erection time.
- An increase in the use of unskilled labor, offering an opportunity to tap untrained labor within the community and to train residents for meaningful jobs in producing housing.
- A variety of manufacturing plants with systems that can be adapted to varying market conditions in the U. S. For example, an on-site plant could be used in a "Model Cities" area to provide maximum participation of lower income persons residing in the area and to offer business opportunities for minority professionals.

It is expected that information in this report will have great value to those who are facing the problems of housing low- to moderate-income families, as well as to those interested in new and more efficient methods for producing housing, such as:

- Housing and renewal agencies (federal, state, and local)
- Housing sponsors (profit and non-profit)
- A broad range of community leaders and elected officials
- Members of the housing construction and supplier industries.

The U. S. is now turning to industrialized building for the same reasons that the Europeans did — a critical shortage of housing and a diminishing supply of skilled labor which, in part, has resulted in limited production of housing at ever-increasing costs. The U. S. government already has placed great emphasis on achieving mass production to meet the housing demand here. HUD's demonstration program "Operation Breakthrough" is a "way to break through to total new systems of housing production, financing, marketing, management and land use," according to HUD Secretary George Romney. HUD has selected 22 producers of housing who will build prototype models on building sites in 8 states. Three of the systems selected were of European origin, Balency-MBM, Tracoba, and Wates, and the tour group visited these systems.

Although the U. S. may be getting into system-building late, it doesn't have to start from scratch. It can combine the experience and lessons learned in Europe with our advanced technological knowledge, production capabilities, and financial resources, to achieve genuine and immediate mass production of housing. We hope that readers of this report will use the information gathered on the tour to support minority demands to produce and administer systems-building operations as an integral part of the emerging housing industry in the U. S.

The task of rebuilding our decaying inner cities and meeting the demand for new community developments in suburban and outlying areas can best be approached through multiracial alliances — an affirmative program for equal opportunity in the production, marketing, and consumption of housing. The nation, and especially its disadvantaged and alienated minorities, must be given a stake in this historic effort to share fully in the responsibilities and benefits of systematizing the outmoded methods now being used in a futile attempt to cope with America's greatest domestic crisis — housing!

■ Definition of Systems Building

The term, "systems building" or "industrialized housing", has many definitions, but for the purpose of this report it will mean "the application of modern management techniques to coordinate design, manufacturing, site erection operations, and overall financial and managerial administration into a disciplined method of building," as defined by Rolland Guy of Battelle Memorial Institute. The report, "Government Policies and the Cost of Building," produced for the United Nations (Geneva, Switzerland, 1959), sets down five different factors that characterize industrialized building.

- Continuity of production implying a steady flow of demand, standardization
- Integration of the different stages of the whole production process
- A high degree of organization of work
- Mechanization to replace manual labor wherever possible
- Research and organized experimentation integrated with the process.

To further amplify the definition, the United Kingdom's Ministry of Housing describes the industrialization of the building industry as "All measures needed to enable the industry to work more like a factory industry. For the industry this means not only new materials and construction techniques, the use of dry processes, increased mechanization of site processes, and the manufacture of large components under factory conditions of production and quality control, but also improved management techniques, the correlation of design and production, improved control of the selection and delivery of materials and better organizations of occupations on site. For this purpose industrialized building can include schemes using fully rationalized traditional methods."

A building system, on the other hand, is a product that can be manufactured off site and erected on site. Ideally it is the physical product of systems building management. Often, however, it is just one of the steps that must be integrated into the total systems building process.

European Experience

Systems building didn't happen overnight in Europe. It was an evolutionary process that was necessitated, in part, by two World Wars which wrought destruction throughout most of the Continent. At the end of World War II, the housing needs of Europe were even greater than they are in the U. S. today.

Four basic factors contributed to the development of industrialized housing after World War II:

- Lack of skilled labor
- A great demand for housing
- The need for low construction costs
- The need for speedy erection of buildings.

Looking at the U. S. today, one sees similar conditions. A relatively slow-growing construction labor force is increasing productivity at too low a rate. According to **Engineering News-Record**, 2.7 million construction workers in 1959 produced construction valued at $66 billion, each worker having an output of $24,000. In 1968 a work force of 3.4 million produced $85 billion worth of construction in constant dollars, representing $25,000 per worker. This is a productivity increase of only 0.4% a year per worker compared with an annual productivity growth of 2.5% for the economy as a whole.

The predicted demand for housing in the U. S. is more than 2.6 million units a year for at least a ten-year period. And in 1970 we're still producing less than 1.5 million units a year.

Expensive and sporadic availability of money plagues the housing industry, hitting both the builder and the buyer. Interest rates on permanent mortgages are up as high as 11% and apartment construction money reaches 14%. The cost of construction, excluding land, has jumped 47% in the last 10 years.

In Europe after World War II, the housing market was there, as it is now in the U. S., and many European governments responded by organizing the market. Naturally, industrialized housing grew faster in those countries with a planned economy or a strong social housing policy, such as Sweden.

The industrialization of the building industry in Europe has reached varying levels of sophistication. In some places nearly 100% of the building is prefabricated, while other areas use rationalized, conventional construction methods which rely on traditional building skilled trades but incorporate a number of improved on-site mechanized processes.

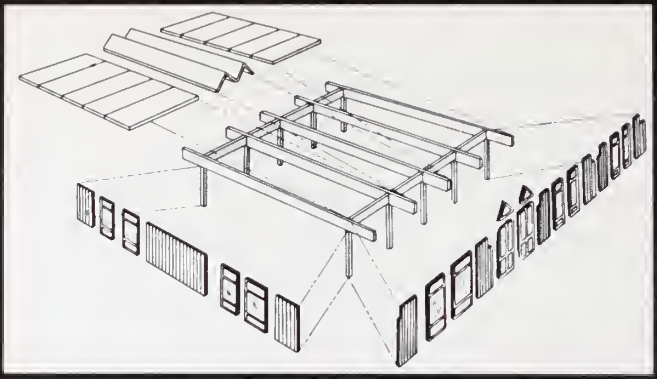
Therefore, the statistics on the use of industrialized building in Europe may reflect all of the various levels or, in other cases, may be limited only to systems where the elements are factory produced.

In western Europe at the present time, it is estimated that 25% of all buildings are erected using some form of industrialized system or subsystem.

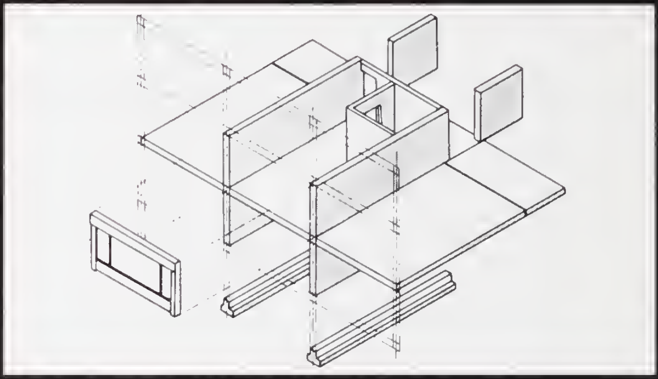
There are four basic types of structural building systems: Post and beam; concrete panel or slab; modular or box; and componetized.

Post and beam: This system is usually prefabricated columns and beams with struc-

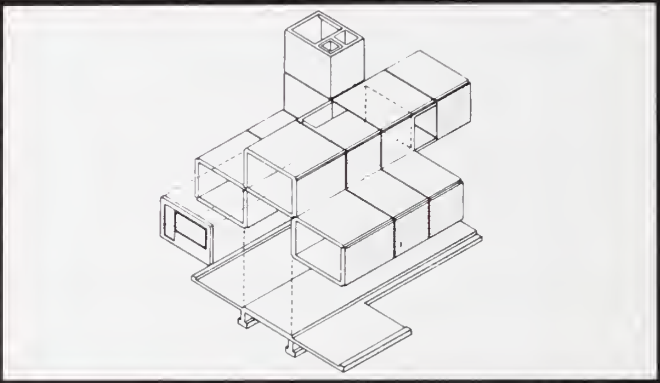
Post and Beam (Frame)



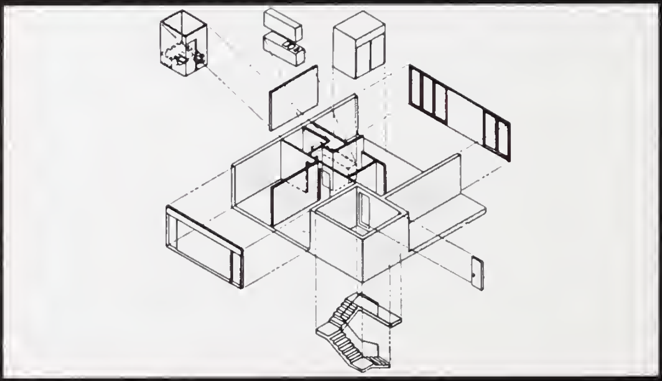
Panel or Slab



Box



Performance or Componentized



Drawings courtesy of
Engineering News-Record
October 30, 1969

tural or nonstructural panels. The components are usually light enough to be erected by men rather than cranes.

Panel or slab: The panel of this system is usually precast or cast-in-place concrete using mechanized formwork. Cast into the slab, in varying degrees of complexity, are heating, water, electrical and other components. The design may be load bearing, crosswall, or core bearing.

Box: This system, sometimes referred to as modular or sectionalized, can take many forms but the basic structural element is a prefabricated, three dimensional unit that may be a partial or complete living unit.

Components: This system results from lightweight components that are designed to meet predetermined performance standards. Subsystems must be compatible by definition. The arrangements of the interior space is flexible.

In Europe, the most commonly found type of building system is a variation of the precast concrete panel and slab type, usually with room-size components with exterior finishes applied and engineered for quick erection.

Systems may be either open or closed. In an open system, the client can take bids from competitive manufacturers for materials and subsystems. The designer can choose from a selection of dimensionally coordinated components that can be combined in many different ways. The closed systems, which have been perfected in Western Europe, are producer controlled. The components of one system are usually not interchangeable with other systems. In reality, however, there may be some flexibility. In some closed systems there may be certain components, such as windows, heating, cabinets, etc., which could be interchangeable with other systems.

In Europe, the development of a building system may be initiated by any of four types of organizations: contractors, engineers, manufacturers, or clients.

The owner of the system or his licensee may handle the entire package from marketing and design through construction. He often works with an architect hired by the client. Or in other cases, the client may select from a catalogue of building types, designs, and esthetics developed by the systems builder.

The heavy prefabricated panel systems that were observed, such as Camus, in England, and Vaneg, in Holland, employ highly mechanized factory methods to produce the panels. Most of the systems place the door and window frames in the panels at the factory. The wall panels are usually factory finished to such a degree that wallpaper or paint can be applied directly with little on-site finishing work.

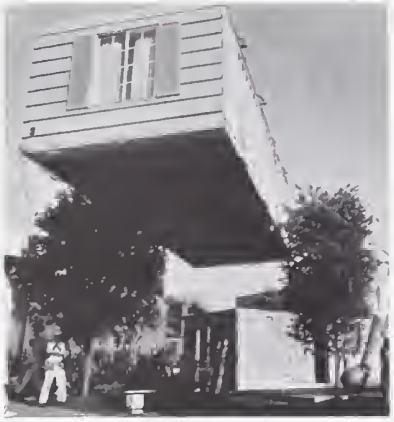
The external finishes and facades are normally applied at the factory. They come in a variety of materials including exposed aggregate, mosaic tile, marble, wood, or brick.

Many of the exterior panels are of sandwich construction with a layer of insulation such as polystyrene cast into the panel.

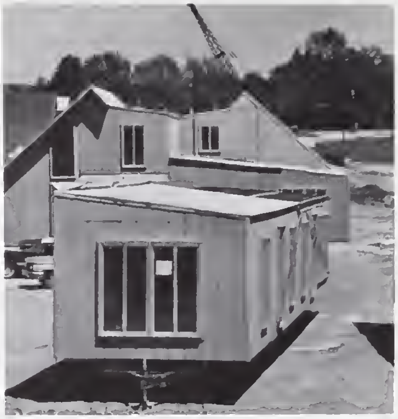
Conduits for electrical wiring, heating ducts, and waterlines are sometimes cast into the panels at the factory also.

In the completely industrialized systems many of the small components, such as bal-

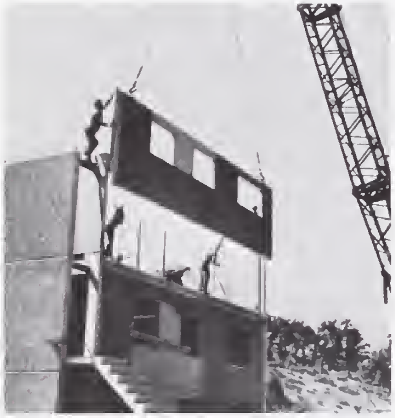
Housing Systems, Made in U.S.A.



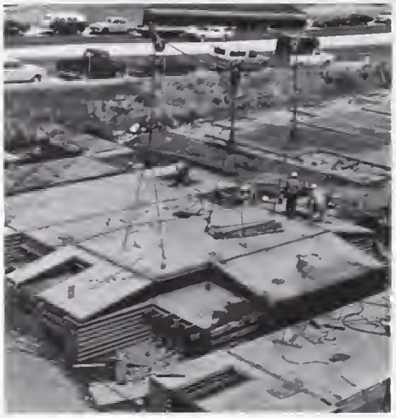
Wood and Metal Box



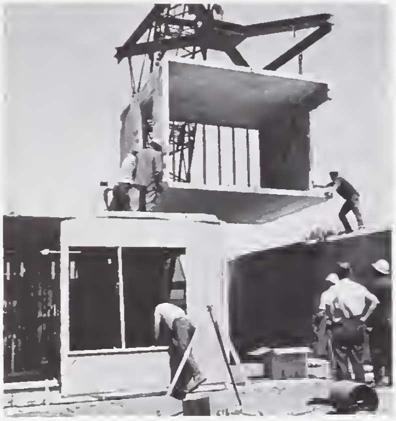
Mobile Home Concept



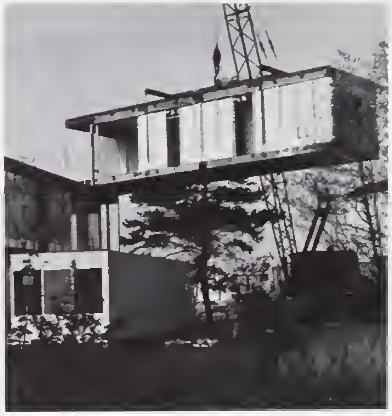
Concrete Panel



Concrete Folding Panels



Concrete Box



Steel Boxes

conies, stairs, elevator shafts, and other items, also are precast at the factory.

The components which are not cast on site are usually trucked to the site on a highly organized schedule that permits continual factory production and site erection.

Site labor is cut to a minimum, requiring, for example, in the Balency-MBM system in Milan, Italy, only four men and a crane operator to erect an eight-story apartment building with four apartments per floor.

Other systems that were observed, such as Sectra and Era, used mechanized cast-in-place techniques with movable formwork to cast concrete panels and slabs.

Most of the systems were used on low- and high-rise multi-family dwellings except for the BPA system in Sweden, which was single-family detached homes, RNK, which was a steel modular system for single-family detached homes and Vaneg, which was used on attached single-family townhouses.

The highly industrialized European systems seen use either expensive central manufacturing plants which are set up on a permanent basis, on site or portable plants that can be dismantled and moved to new locations as new contracts are received, or on-site prefabricated formwork. The most expensive is the permanent factory, which requires a capital investment ranging from $1.5 million to over $3 million. Temporary plants, on the other hand, can be erected for $200,000 to $300,000.

The market situation dictates the type of plants used by European system builders. Usually if the builder is assured a concentrated market within a certain economical radius of transportation, 50 to 100 miles on the average, he will set up a permanent plant. For example, when the Milan municipal administration launched a 5-year program for 23,000 dwellings of high-rise construction and signed contracts with five companies assuring each 5,000 units of production over a 5-year period, MBM-Balency set up its permanent plant outside Milan. Most of the larger system builders in Europe, such as Camus, Coignet, and Balency, have central plants. The Wates system in England, on the other hand, has a portable on-site casting plant. According to Norman Wakefield, managing director of Wates Construction Ltd., the most important factor is the capital investment that the local market can economically support.

Most of the systems in Europe, especially Italy, France, and England, use concrete as the basic material. This is not a matter of consumer taste or market demand, or flexibility, but rather an economic factor. The materials for producing concrete were more plentiful and cheaper than wood. As a result, people are conditioned to accept concrete as a building material as opposed to the situation in the U. S. where concrete is used predominantly in commercial apartment and office buildings rather than in individual homes. Americans tend to think of concrete jungles when they think of residential dwellings constructed of concrete. This is probably a reaction to the poor and unesthetic use of concrete in low-rental housing construction. But as seen on this tour, good architecture and sensitivity toward the consumer can translate concrete panels into esthetically pleasing structures, such as in the new town of Thamesmead. Often though, the economic and rapid construction needs are the prime goals of housing authorities, and esthetics have to take a back seat. It appears that this can be overcome with U. S. technology and attention to user needs.

According to the companies visited on the tour, the major advantages of industrialized building are:

(1) Labor man-hours are reduced up to one-half over that required in conventional construction. The exact figure is not easy to pin down. It depends on the degree of industrialization, the management organization, the system, and the type of building being erected.

(2) Building is not restricted by weather conditions and seasonal variations. Since most of the components are cast in factories or, if cast out-of-doors, use heated formwork, production can continue year-round. This is especially important in countries, such as Sweden, which have long, hard winters.

The speed of industrialized housing production, according to Riccardo Meragaglia, president of MBM-Balency Associated, of Milan, is double that of conventional building in Europe.

System building uses 75% to 85% unskilled labor, which can be trained in 2 to 4 weeks. This is an important factor to consider in terms of application in the U. S. Under Section 3 of the Housing and Urban Development Act of 1968, HUD-assisted programs require "that opportunities for training and employment arising in connection with the planning, construction, rehabilitation and operation of housing under the programs be given to lower-income persons residing in the area of the housing."

(3) Systems building substantially reduces the time required to erect a dwelling. For example, in the Vaneg system eight men can erect three houses in a day.

(4) Systems building reduces costs about 10% to 15% below that for conventional construction in Europe.

Another advantage tour members noticed, especially in highly industrialized systems with central plants, was comfortable working conditions for employees, including cafeterias, good sanitary conditions, year-round employment, vacation and training. Many of the companies also provide medical assistance and social services to their employees.

In Europe, at the present time, there are hundreds of systems available although many are still only experimental. In appearance, many seem similar. Basic differences are the materials, the dimensions of the elements, and, most important, the joint details. Some are more adaptable to low-density, low-rise structures while others are more economical for high-density structures. The capsule descriptions of the 18 systems that were seen on the tour illustrate the broad cross section of design flexibility, methods, and techniques that are available in industrialized building and cite where possible examples of production rates and erection time.

■ Description of Systems

Balency-MBM (French/Italian)

The Balency-MBM system, which is an "Operation Breakthrough" winner, is based on factory-produced, reinforced concrete, bearing walls completely finished with exterior veneers, interior finishes, windows, insulation, and electrical work. Except for the foundations, the floor slabs are the only cast-in-place structural elements. The systems originated in France but is already represented in eight countries.

The plant near Milan, at Trezzano sul Naviglio, has a production rate of 2,000 to 2,200 dwellings per year. However, at the present time, only the first half of the plant is built and in operation, producing about four apartments per day.

Panels are produced in a highly organized, assembly line process, using both vertical and horizontal casting machines.

The casting machines are heated with hot water. Curing takes 2 to 3 hours. Production of a 100 square-foot panel takes 1½ man-hours of labor.

To produce the exterior wall panels, horizontal casting machines are used. Exterior veneers such as brick, mosaic, tile, marble, marble chips, colored cement, or other finishes are embedded in the concrete. Both the horizontal and vertical casting machine can be adjusted to the desired dimension of the panels up to a maximum 10- x 22-foot panel.

At the erection site, tower cranes moving on tracks can assemble a complete shell of 1 to 2 dwellings per day. For multi-story buildings, floor slabs are usually cast-in-place.

Reinforced steel for the floor slabs and coils for the radiant heating system are assembled on a template on the ground.

The advantage of this system includes up to 50% reduction in total man-hours and 30% to 50% reduction in on-site man-hours, according to MBM. A further claim is made that construction time is reduced by 50%, since site preparation and factory production go on simultaneously. When the shell is erected, the building is already 75% complete.

In Milan, Balency-MBM completes two typical buildings with 72 units in eight months, using 28 men.

About 85% of the labor is unskilled. According to Riccardo Meragaglia, president of **Impresas Generale Construzioni MBM** (which joined the Balency firm of Paris to form Balency-MBM Associated), each of his men produce three dwellings per year, working 2,000 hours. The output of U. S. construction workers, working 1,400 hours per year, is only about one dwelling.

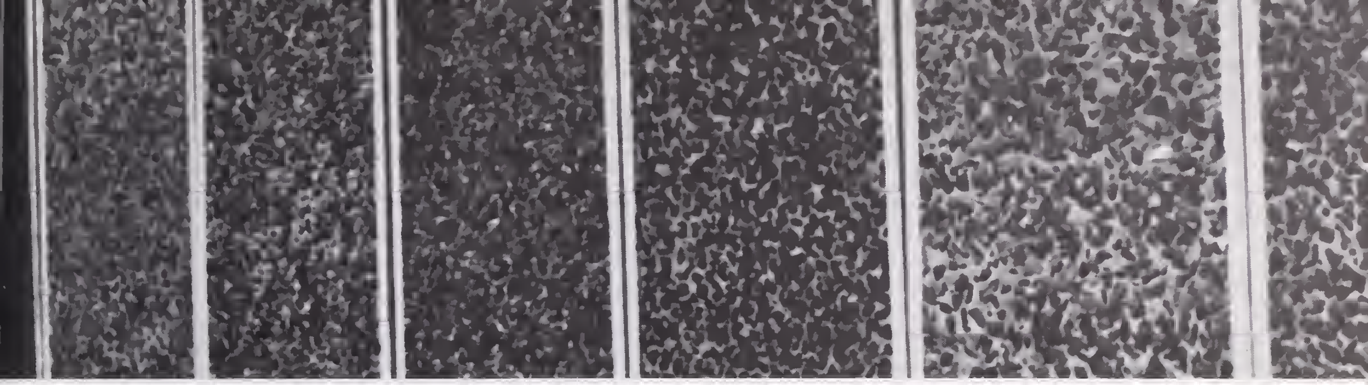
The total investment for the MBM plant, workers' cafeteria, and site equipment was $3 million to $3.5 million.

Balency-MBM Associated has already set up a U. S. office, Balency-MBM U. S. Corporation, to license U. S. firms.

(Above) Concrete batching plant with automatic feeders. (Top right) Horizontal casting machines for exterior walls. Note blocking for doors and windows. (Bottom right) Vertical casting machines. A transit mixer pumps concrete in from the bottom, thus eliminating air bubbles in concrete.

(Next page, left) Crane for lifting panels into position. A pre-cast retaining wall is in foreground. On a structure of this type, it is possible for four men to erect one floor per day. (Top right) An example of the variety to be had in exposed aggregate finishes which may be pre-colored as well. (Center right) A partial example of the variety in textured concrete finishes: (Lower right) This nearly completed building shows design flexibility and the variety of exterior finishes which may be achieved.

(Top left) Pre-cast panels and staircases to be loaded onto specially-built trucks for delivery to construction site. (Bottom left) Quality inspection and minor repair station. Note that plant has sliding roof. (Above) Utilizing hooks which are cast into panels, a tower crane lifts panel into place. (Right) Panel nears position. Note simple manner in which panels are braced during fitting process.



(Top) A typical kitchen. The dividing wall shows the ability to achieve truer lines through industrialized building methods. (Bottom) A typical living room. Wallpaper can be applied directly to concrete slab.

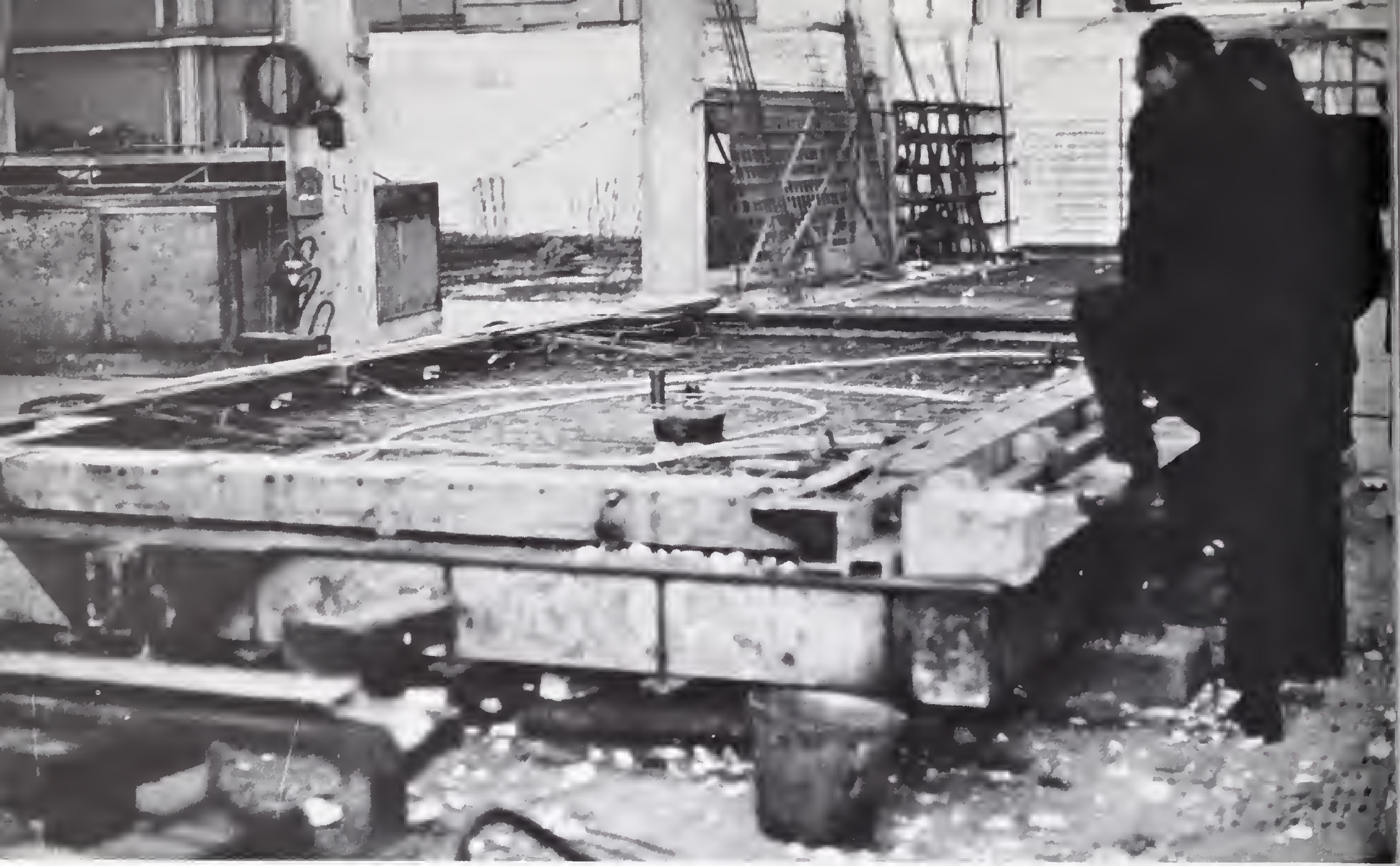
Camus (French)

The Camus system, the world's largest ane one of the oldest industrialized systems, is composed of heavy precast concrete, insulated wall panels and floor slabs of room size manufactured in an off-site factory. The panels incorporate many of the building components, including doors, windows, ducts, ventilation flues, and holes and conduit runs for services. Staircases, with holes for handrail supports and finishes cast in, are produced at the factory.

The panels are cast on horizontal casting tables with adjustable edge moulds. Mosaic facings can be cast in the mould.

The system is adaptable to building from two to 23 stories. There are now 23 Camus factories throughout the world, excluding the USSR where it is estimated that there are 30. A typical contract, visited in England, consists of four identical high-rise buildings, each having 114 apartments. It takes three months to erect the panels for one building. Normal completion time for the four blocks and three, one-tier garages is 33 months. The dollar output using Camus methods is $20,700 per man-year. The national average in England, using traditional methods, is about one-half that amount, according to the English licensee.

(Next page, top) Exposed bed of horizontal casting table, which has adjustable edges. Note electrical conduits in place. (Bottom) A form of stationary, horizontal casting mold with built-in equipment for fast curing.



Coignet (French)

Like many other French construction method, this system consists of load bearing, external walls, fitted with balconies and intermediate bearing walls. Cantilevered between the inner walls and facades are floor slabs which overlap the bearing walls. The electrical conduits are cast in at the factory. All that needs to be done on-site is to insert wiring and connect switches and junctions to the cast-in boxes.

The facades are sandwich-type construction with two layers of concrete, insulated with an expanded polystyrene layer. Finishes such as blasted concrete or painted concrete are attached to the facades while the internal face of the element is smooth. The precast floor slabs form the surface of the apartment at one level and the ceiling of the apartment below. The floor is finished at the factory with any number of different materials — parquet, tile, or smooth-surface concrete.

All of the precast elements are produced in a off-site factory and transported to the site. The units leave the casting machines in the position that they are placed in the building — floor and balconies horizontally and walls vertically.

At the erection site, tower cranes lift the elements into position. The foundations are built using traditional methods, and the first floor is cast on-site using special prefabricated forms. The wall units rest on a strip of rubberized asphalt that acts as a base. Adjustable clamps hold the elements in place temporarily. Two men can handle these operations. One crane can erect 40 units, representing 200 tons of reinforced concrete. The erection team uses the precast units which are made at the factory by 45 men working at fixed stations.

On the sites visited by the tour, the time to put up 1,000 to 3,000 dwellings was reduced to 5 man-hours for slightly more than a square yard of floor area. This includes the installation of windows, electricity, plumbing, and other subsystems. Two dwellings are erected each day, with the completion of a six-apartment floor in 4 days. Coignet has 13 factories in operation in four countries: France, Holland, Germany, and Italy. They have a total capacity of 56 dwellings per day, producing more than 10,000 dwellings per year.

An American licensee is preparing to erect a factory in Florida to build luxury apartment buildings. Another plant is being considered in the New Jersey area with minority group participation in ownership and management.

Estiot (French)

This is essentially a composite system of precast, load bearing, concrete cross walls, facade panels and floor slabs welded to a steel framework.

At the erection site, the light steel framework is set up. To it is added reinforced concrete slabs and panels cast in an on-site yard. After the concrete elements are hoisted into place on the steel structure, the steel ties are welded, and the horizontal and vertical joints are concreted.

The work on-site consists of casting and concrete panels and hoisting the units into place. Semi-skilled labor may be used in the erection process. A crane team of three or four men can hoist, position, and fix four or five panels per hour with one crane. A 1,080-square feet apartment takes 200 to 250 man-hours to erect. This system is economical for building projects comprising one or more buildings of at least 300 to 500 apartments. **Societe Estiot** licenses the use of the system to a general contractor who retains the management of the contract and those parts of the work that are done by traditional construction methods. Estiot gives technical supervision in site organization, precasting, and erection.

G.E.A.I. (French)

This is a lightweight, steel and aluminum, component system with floor decking made up of small precast concrete slabs. The performance-oriented system was developed by a firm of French architects, headed by Marcel Lods and Paul Depondt. Steel rods are welded to steel rings on a temporary working shed to form the floor framing. Ten of these modules, joined together, form the entire floor of one building which is a five-story walkup, with five apartments per floor.

Exterior curtain walls consist of aluminum outside, an insulating layer, and a vinyl facing. A steel column core goes up first, then prefabricated floor units are attached. The erection scheme permits an entire floor panel, about 22 feet by 35 feet, to be carried to the site and lifted into position in one movement. Interior partitions are movable so room arrangements are entirely flexible.

On the Rouen project, a crew of four men in the staging area and four on the building erected the framing for one building in 8 days after the foundation was placed. Doors, walls, floors, ceiling, and roof were installed in another 52 days so that, in a total of 60 days of site work, the building was complete.

The system is now in the U. S. under the name Systems III, controlled by Chicago-based firm, Component Building Systems, Ltd. A $10-million housing development, sponsored by a community non-profit organization, is planned for Chicago's south side.

Sectra (French)

Similar to Era, this system is used for load bearing, multi-story, reinforced concrete structures. The load bearing external walls, floor, and roof slabs are cast in one operation on-site. Although the system originated in France, it has licensees in England, Holland and Spain.

On-site, the elements are cast in inverted, U-shaped, heated, steel forms (tunnel forms), which are handled by a tower crane. Curing takes 13 hours.

The cast-in-place structural elements are combined with precast stairs, non-load bearing cross walls, and cladding materials.

The manufacturer estimates that savings in cost range from 14% to 25%, compared to conventional building with time savings as high as 50%.

Experience in France has shown that a team of eight men, with a crane driver, can erect the bearing structure of 60 apartments in a 15-story building in 35 days. Each apartment takes about 65 to 68 hours.

(Right) View of kitchen, illustrating wall finish. (Below) An example of exterior variations and architectural flexibility, utilizing tile, brick and concrete.

Tracoba No. 1 (French)

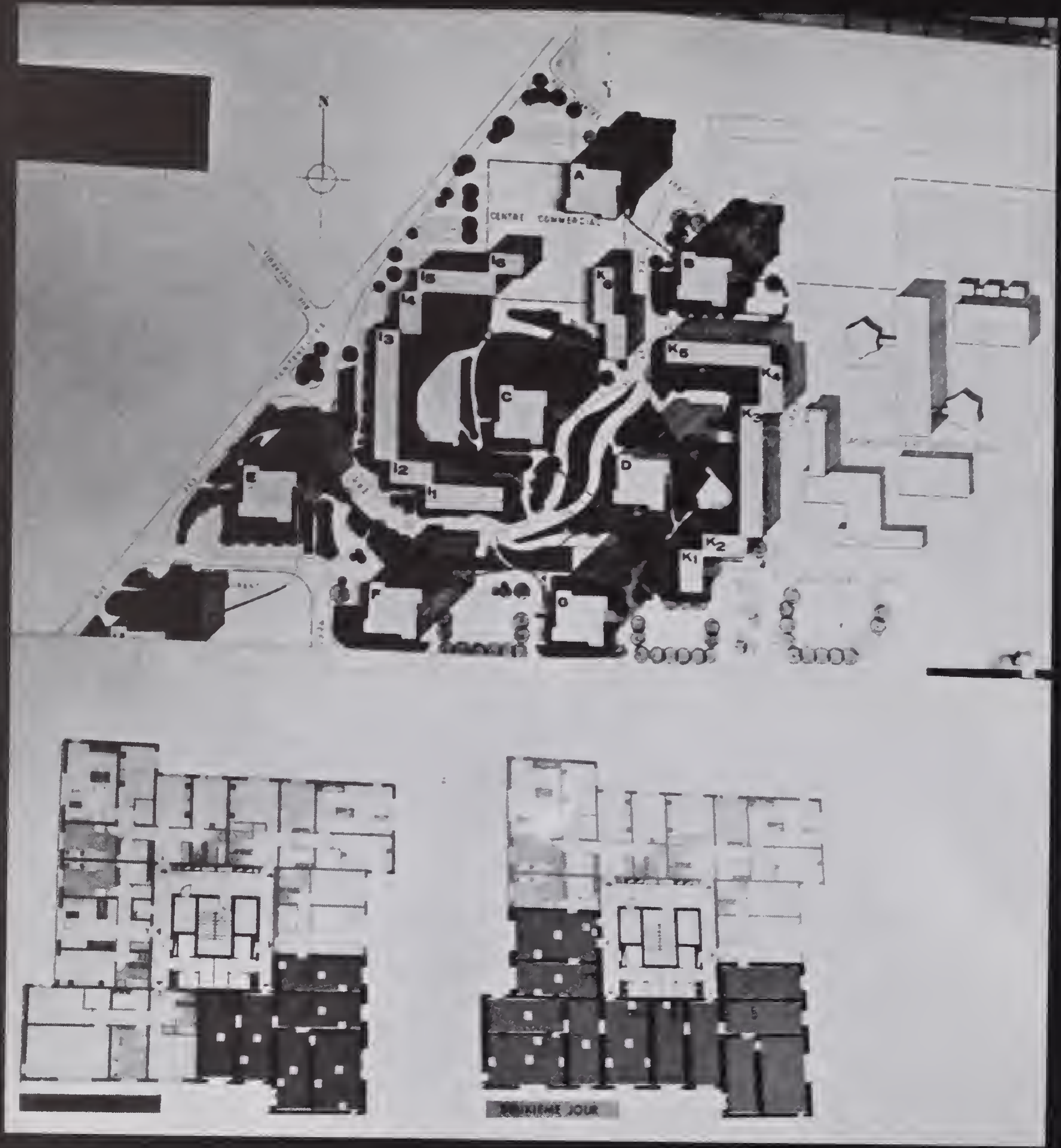
This is a concrete panel system with load bearing cross walls and non-load bearing exterior walls cast in an on-site factory. Cross walls and floor slabs are flat, reinforced concrete slabs. The facades are made either as sandwich panels of concrete and polystyrene or with expanded clay-aggregate concrete. The non-loading bearing facades are hung from the ends of the cross wall by means of steel devices.

Production takes place in on-site factories or semi-permanent installations that sometime serve several sites. The factory has several bays, each with its own portal crane or overhead gantry. Each bay includes vibrating steel tables which are heated and can be tilted, vertical batteries that also are heated and vibrated, and special moulds for non-planar units. The equipment is stationary.

At the on-site factory in Nanterre, the production capacity was two dwellings per day or 40 units. The factory had 11 tables for horizontal casting and special moulds for stair and complex units. Also included were two moulds for producing the cross walls, turning out four units a day each.

Capacity for this on-site factory was 114 units of low-cost housing, consisting of 10 buildings, each having 19 stories. The typical floor contained 120 precast units, and could be erected in 5 days with 13 men working a 10-hour shift. The production staff backing up this operation has 23 men also working a 10-hour shift. The cost of the plant was $250,000.

Tracoba, which is one of the "Operation Breakthrough" winners, is affiliated with Omnium Technique — a firm of consulting engineers. Tracoba has developed prefabricated and mechanizezd precasting systems. It places these at the disposal of contractors, offering them the aid of its engineers and technical staff. Tracoba's representative in the U. S. is Industrializzed Building System of New York City.



(Above) Site plan and floor plan layouts, illustrating capability of a system to relate to a specific environment. (Next page, top left) Workman smoothing concrete in horizontal casting mold. (Top right) Joint detail with panel recess showing conduits for mechanical equipment. (Below) Variation in panel is evident as it is moved to storage.

Bison (English)

The Bison system for multi-story buildings consists of precast concrete floor slabs and precast concrete load bearing cross walls. All of the elevator shafts, staircases, and walls are precast conrete, normally produced in one-story heights. The floor slabs are in room-size units. The bathroom is cast as a single unit weighing 7 tons. Balconies may be added if desired.

The external walls are sandwich type construction with an insulating layer of polystyrene. Ties fix the external section of the wall to the inner and structural elements. No subsystems are provided for in this system except for integrated wiring.

Wallpaper or textured paints can be applied directly to the smooth surfaces of the walls and ceilings.

There are nine permanent Bison factories in England. These produce all of the precast components used in the system. American licensees are expected to start production in the Connecticut, Maryland, District of Columbia, and Chicago, Ill., areas in the new future.

For a basic two-bedroom apartment, where there are four apartments per floor, there are about 22 precast component parts per apartment. Eight to ten men erect one apartment. The builder claims a two-thirds saving in erection time. The American licensee is Strescon Industries of Baltimore, Maryland.

Gle (English)

This panel and slab system has precast, load-bearing cross walls, precast partition walls and cast-in-place concrete floor and roof slabs. The cross walls are normally 8 feet wide, in one-story heights, but dimensions can be varied.

The floor and roof slabs are continuous, with the wall units locked into the floor and roof slabs. For the cast-in-place floor, preformed reinforcing mats are used.

The wall units are precast on-site in continuous production. For the cast-in-place floor slab, mobile tables are used. After the floor slab is cast, the forms are left in place to permit erection of the cross wall for the next floor whole the previously cast floor slab is still curing.

Any type of panel can be applied on the non-load bearing walls. The system can be adapted to use timber frame, incorporating fiberglass insulation, and lined internally with plasterboard and externally with felt under concrete tile, or exposed aggregate sandwich panels. If necessary, the system can incorporate conventional cavity walls. The load bearing walls can be faced with brickwork or precast, exposed aggregate panels.

The casting yard for wall slabs of a 400-dwelling contract covers an area of about 200 square feet. The system is mainly for low- to medium-rise structures, with a great deal of flexibility possible in the apartment layouts.

Wates (English)

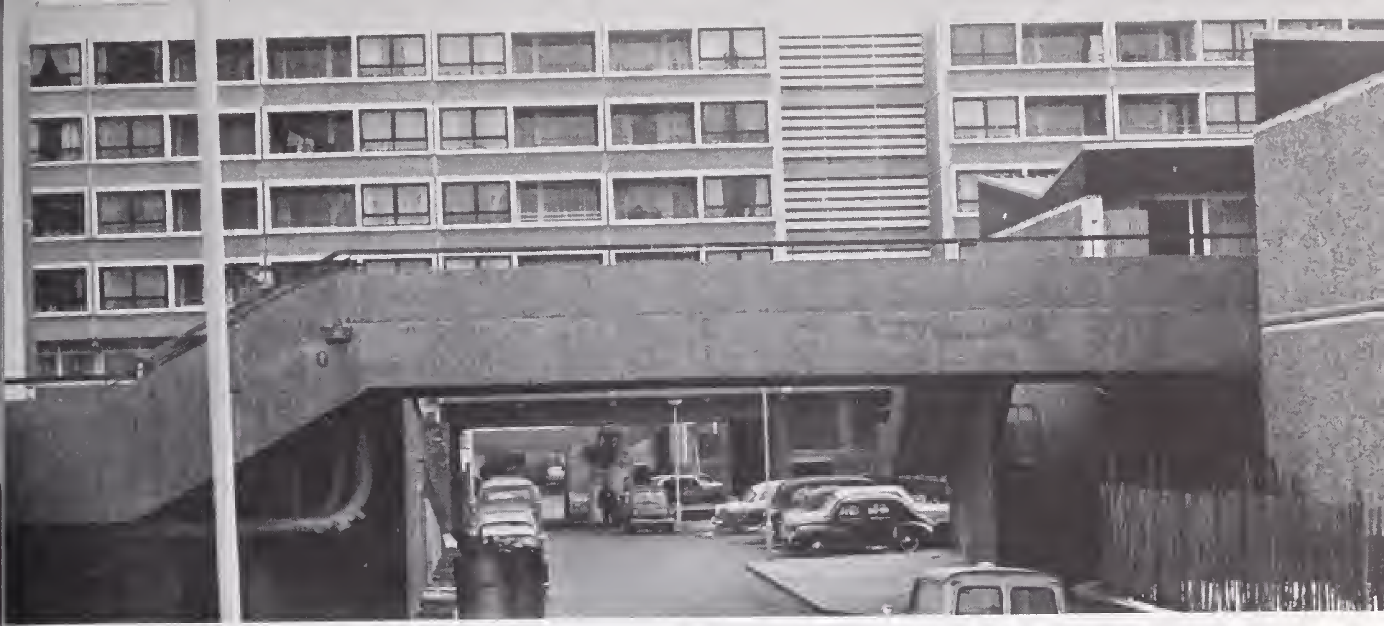
The Wates system, which is one of those chosen for "Operation Breakthrough," consists of precast concrete floors, load-bearing walls, staircases and refuse chutes. These units are cast in standard steel moulds, adjustable in 12-inch increments. Steel loops, which project from the floor panels and the tops of cross walls, are joined by steel runs and are grouted into place. This procedure interlocks the cross wall with the floor above, forming a one-story T. Balconies can be added, supported by the cross wall panel projections on the same plane as the floor.

The system employs a highly flexible, mobile, on-site production plant costing about $2.5 million in England. About 50% of the capital cost is normal construction equipment.

For the on-site factory, the standard production lines are 30 feet wide and are covered with a mobile shelter that runs on rails. The walls are cast in vertical moulds. The panels have all electrical conduits, fixings and inserts cast in them. An accelerated curing process permits a 24-hour turnaround for the moulds.

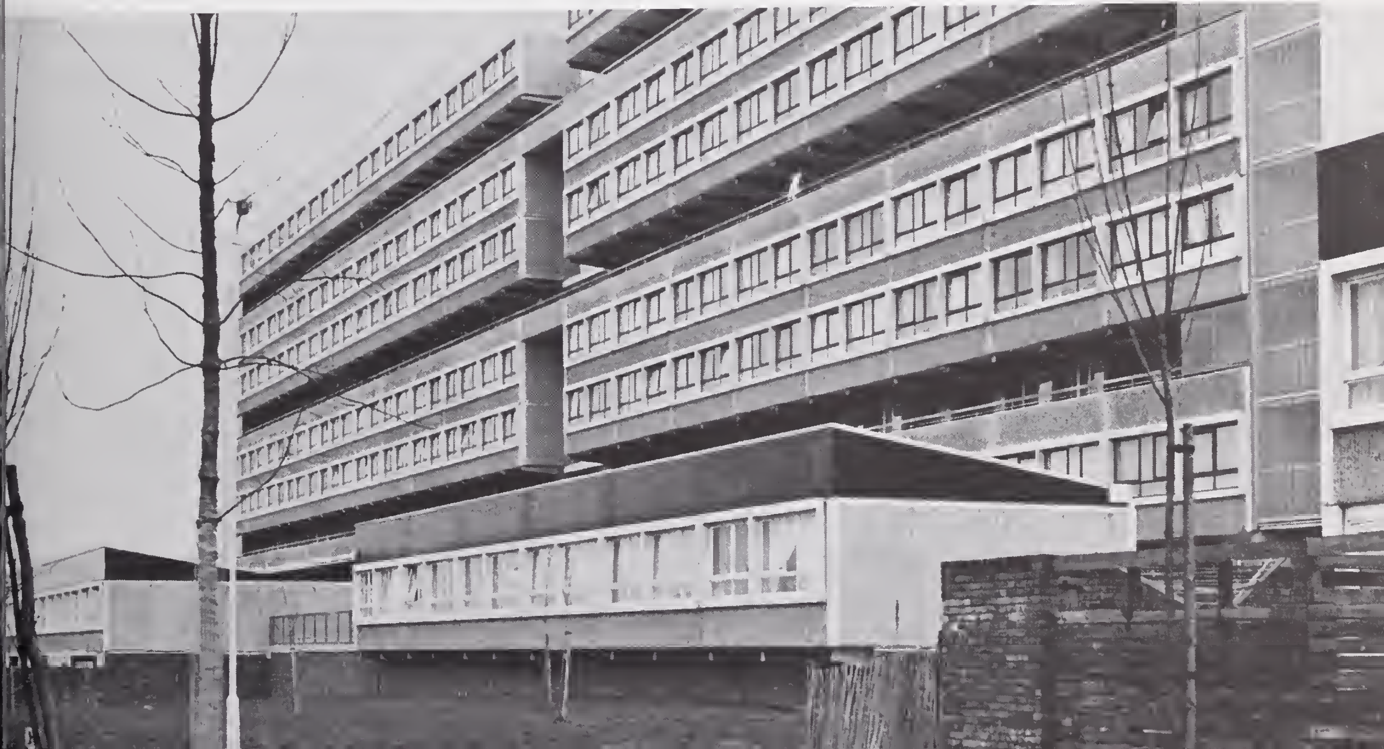
The factory can produce between 10 and 20 dwellings per week. About 700 man-hours are required to produce one apartment.

Kidbrooke Depot Site
Primary School
ILEA
wates



An apartment complex showing separation of vehicular and pedestrian traffic.

A new apartment building combining low and medium-rise.



BMB (Dutch)

This system is a brick panel system, originally developed by a British engineer in 1933 and further developed in 1947 by the **N. V. Nederlandsch Bouwsyndicaat.** There are now four major plants in Holland, which have produced more than 12,000 units. The prefabricated system is composed of factory-made, load bearing, concrete walls and precast floor slabs. One of the most important features of the system is that it casts a brick veneer into the concrete wall panels, forming the exterior surface. The walls are cavity walls, formed with the brick veneer connected by steel ties to a lightweight concrete backup. The internal walls are not structural, giving the client freedom of layout.

The elements come from three different off-site factories, each one producing a different element. The brick veneer elements are produced on rolling assembly lines with men remaining stationary. The dimensions of the panels can vary according to the designer's request.

A low-rise building of six stories can be completed in 10 months with two months for the foundations, three months erection time and five months to finish the structure. Each dwelling takes between 500 to 550 man-hours to erect, using one-third skilled labor and two-thirds unskilled.

Era systems (Dutch)

This system is cast on-site with patented ERA tunnel moulds, which are three-sided tunnels or inverted U sections into which the concrete is placed. These forms cast the load-bearing, reinforced concrete skeletons in monolithic construction. The forms are set up with conventional tower cranes. Into these skeletons are placed packaged units which have all of the built-in parts such as partitions, frames, sills, and other units that make up the structure.

After the vertical wall sections are complete, one-half of the horizontal form section of each unit is pulled out of the building by the hoisting platform toward the front, the other half toward the rear. The form sections then are placed on the next level, positioned, and a second story cast. Heating installations keep the concrete at constant temperature during curing. The forms are designed so that openings and channels can be made and piping, sockets, outlets, and external connections can be installed.

Floors are free spans between separating walls. One of the interesting features of the system is that the partitions are moveable. As the family grows, partitions may be removed at very low cost without affecting the structure.

The packaged units are factory produced. According to the manufacturer, this offers many new possibilities: the shell building is simple, reliable, and inexpensive; the packaged unit can be varied to meet special requirements; all parts are factory made, insuring a high quality product, and all components may, if required, be replaced.

Wall and floors, cast-in-place on the site, can be provided with any finish desired without sanding or other preparation.

The system may be applied to both high- or low-rise buildings, as well as office buildings, hotels, or any other type of structure having identical rooms.

The system uses only 15% skilled labor.

RBM (Dutch)

This system is a combination of cast-in-place concrete floor slab and precast bearing walls. The conduits for the electrical system are put in at the factory. The forms are re-used every four hours.

The bearing walls are cast at one factory, the smaller elements such as staircases and balconies are done at a second factory, and the wooden window frames, doors, and other amenities are produced in a third factory. The capacity of the factories is 1,500 units per year.

The system uses one skilled worker to every three unskilled, and approximately one-half of the work is done in the factory. A total of 150 people are employed. The smallest number of units considered feasible is 150 per year. The capital investment for the plant is about $2 million. It can produce one dwelling in 900 to 1,000 man-hours.

Vaneg (Dutch)

Introduced in 1965, this system consists of factory-produced, load-bearing, concrete panels and slabs which are bolted together at the site to form attached, two-story, single-family dwellings.

The production method uses a horizontal, moving belt system which consists of 50 mould tables. These move automatically to the next position every 8 minutes. From start to finish there are six phases: seven preparation positions, three casting positions, six prehardening and surface finishing positions, thirty-two hardening positions, the grinding position, and the final discharge of the element by tilting the mould, which then returns to the first stage.

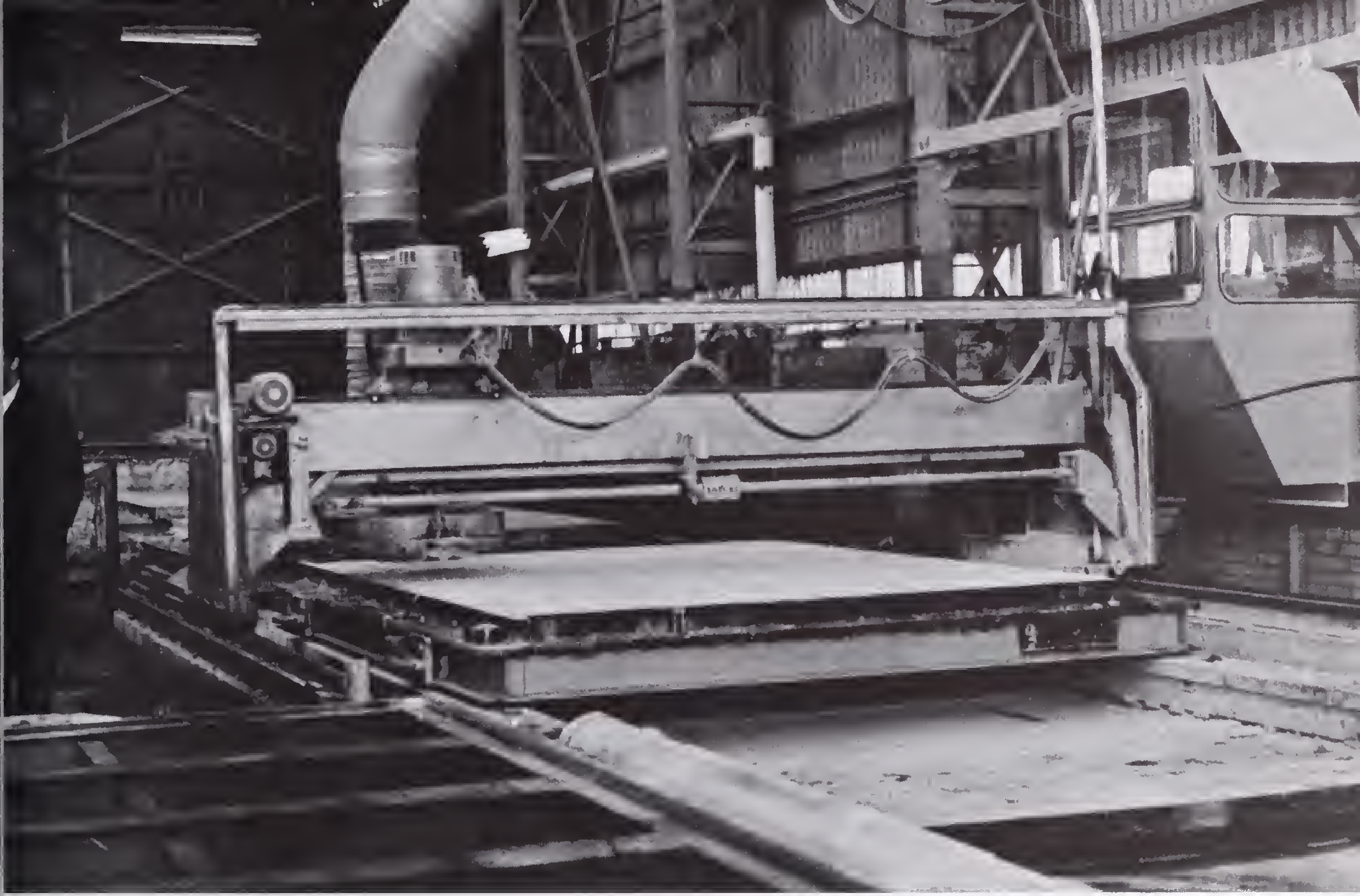
After the concrete is placed in the moulds, the elements travel through a hardening tower where radiation heats the concrete. At the end of the conveyor belt, the moulds are tilted upward and the element is moved by an overhead hoist mechanism to the storage area. An element is turned out every 8 minutes.

The factory seen on the tour can produce 50 different elements, or two different types of houses, at one time. In 24 hours, with three shifts on the production line, it can turn out 180 elements or about seven houses per day. This is maximum capacity of 1,650 houses per year.

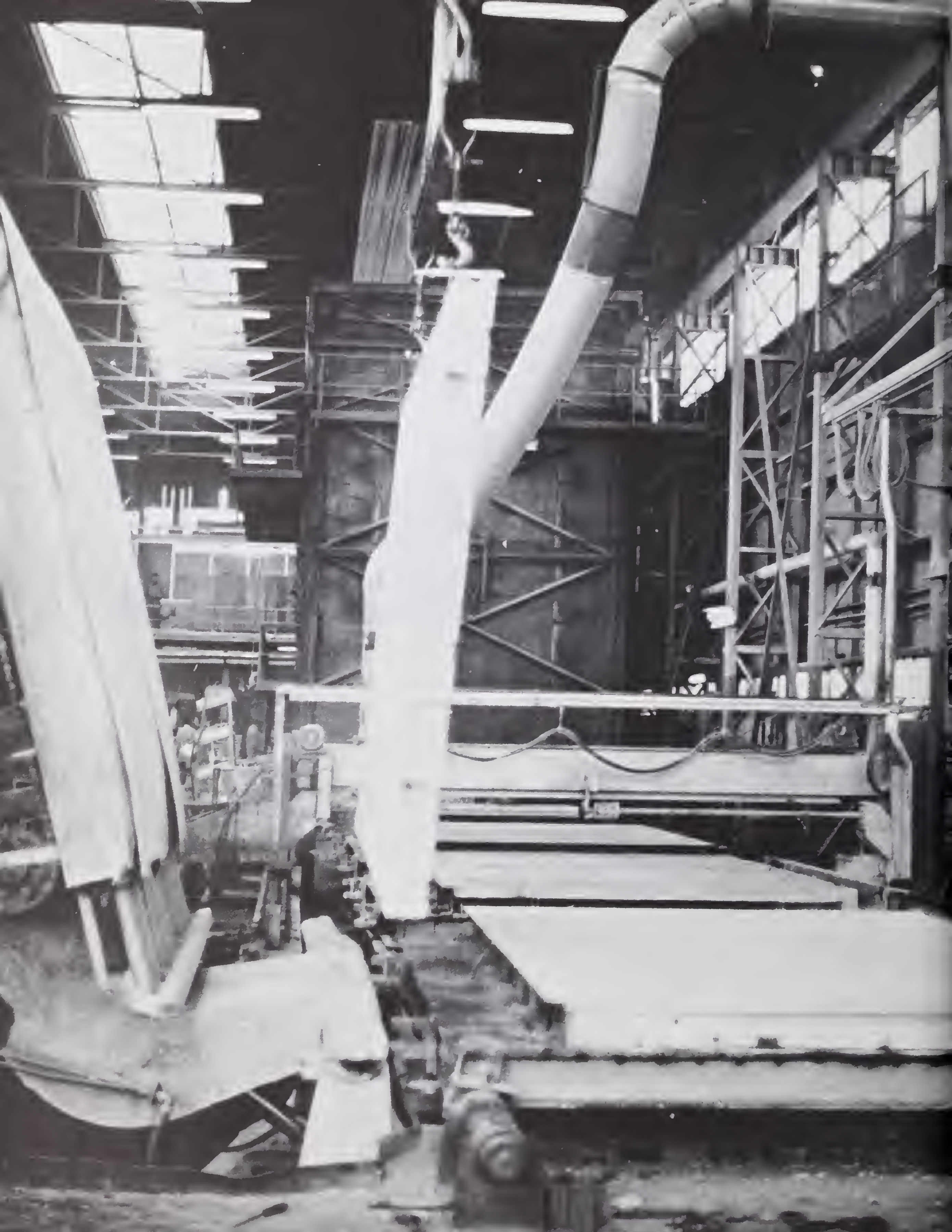
To transport the panels to the site, Vaneg uses 20 low loaders. At the erection site, eight men can erect three houses a day.

Presently, they have three basic types of houses under production. The factory is geared to turn out as little as 150 units of one type and erect each dwelling in 340 to 380 man-hours.

The factory, which requires up to 1,100 square feet of production space, represents an investment of $1.5 million and employs a total labor force of only 98 men, including the managers and foremen.

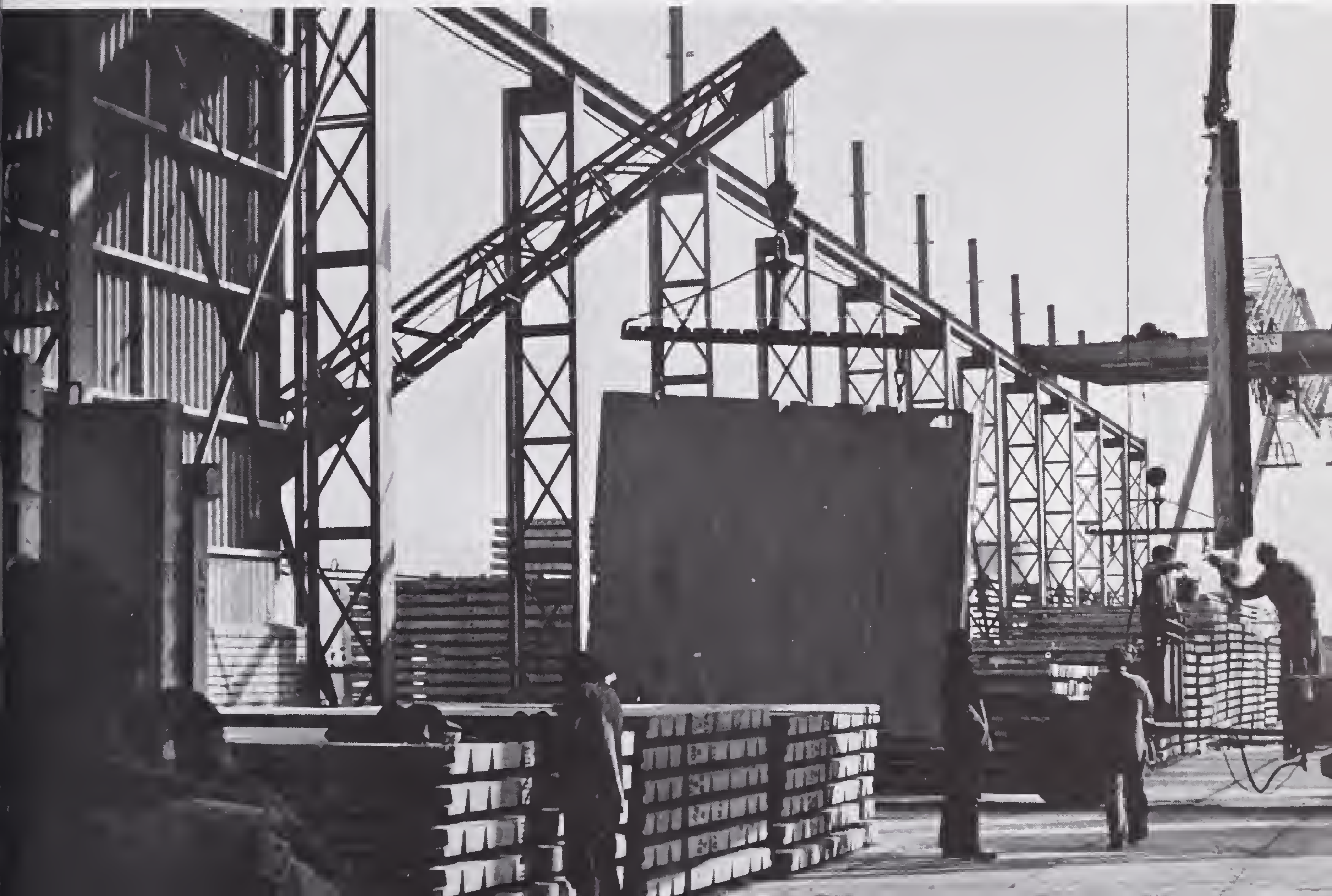


Horizontal, moving belt system for casting panels.



(Left) Horizontal casting mold with cured panel being removed mechanically.

Lifting and storage operation.

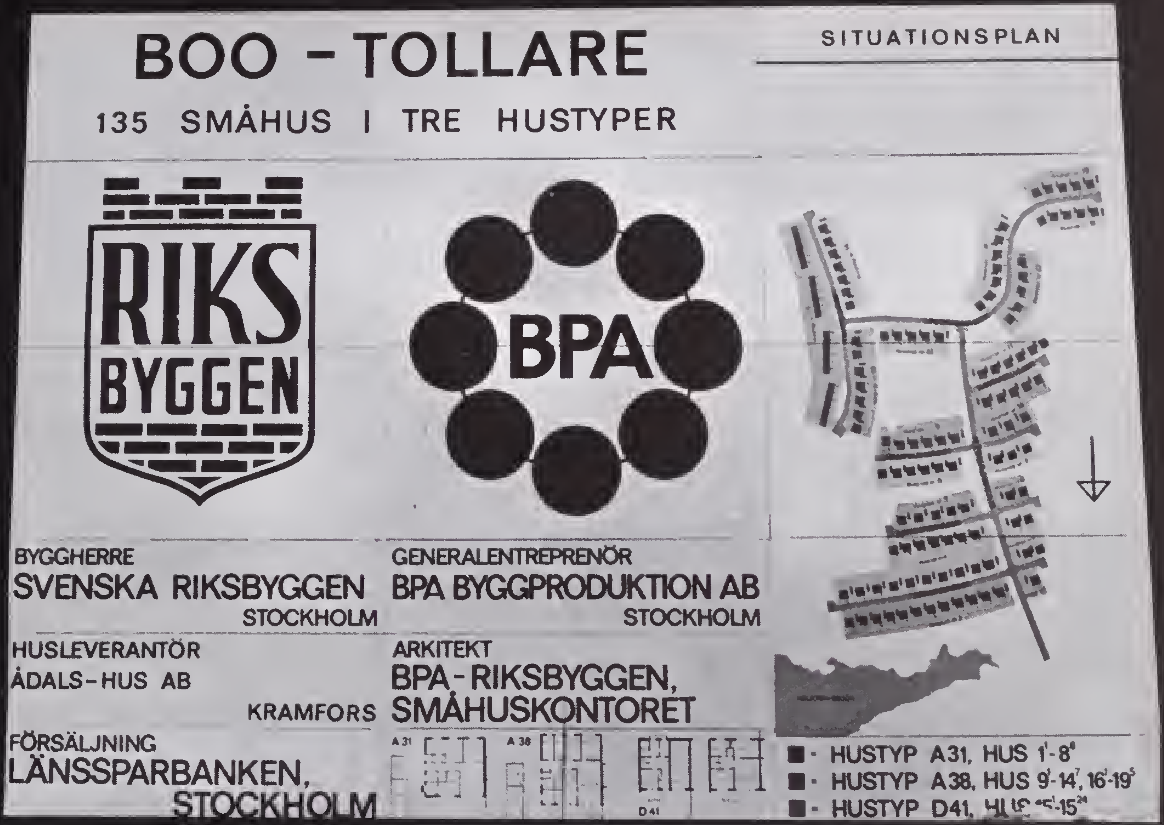


BPA (Swedish)

This union-owned and developed, wood panel frame system is used to construct single-family homes. Insulated panels are discharged at the site in the same order as they are to be erected.

A crane lowers the panels onto a concrete slab foundation and the interior walls are assembled and pulled together with screws. Factory installed electrical installations are coupled together at the building site. Eaves and gables are delivered prepainted from the factory. The roof and the ventilation stacks with ducts are also delivered and erected in sections.

A house is normally assembled in one day complete with electric heat connected, by a 6-man team. Flooring, painting and finishing work may be started immediately after the house has been assembled. If a house is to be faced with brick, 21 workmen are required to complete it.



BOO - TOLLARE

135 SMÅHUS I TRE HUSTYPER

SITUATIONSPLAN

RIKS BYGGEN

BPA

BYGGHERRE
SVENSKA RIKSBYGGEN
STOCKHOLM

GENERALENTREPRENÖR
BPA BYGGPRODUKTION AB
STOCKHOLM

HUSLEVERANTÖR
ÅDALS-HUS AB
KRAMFORS

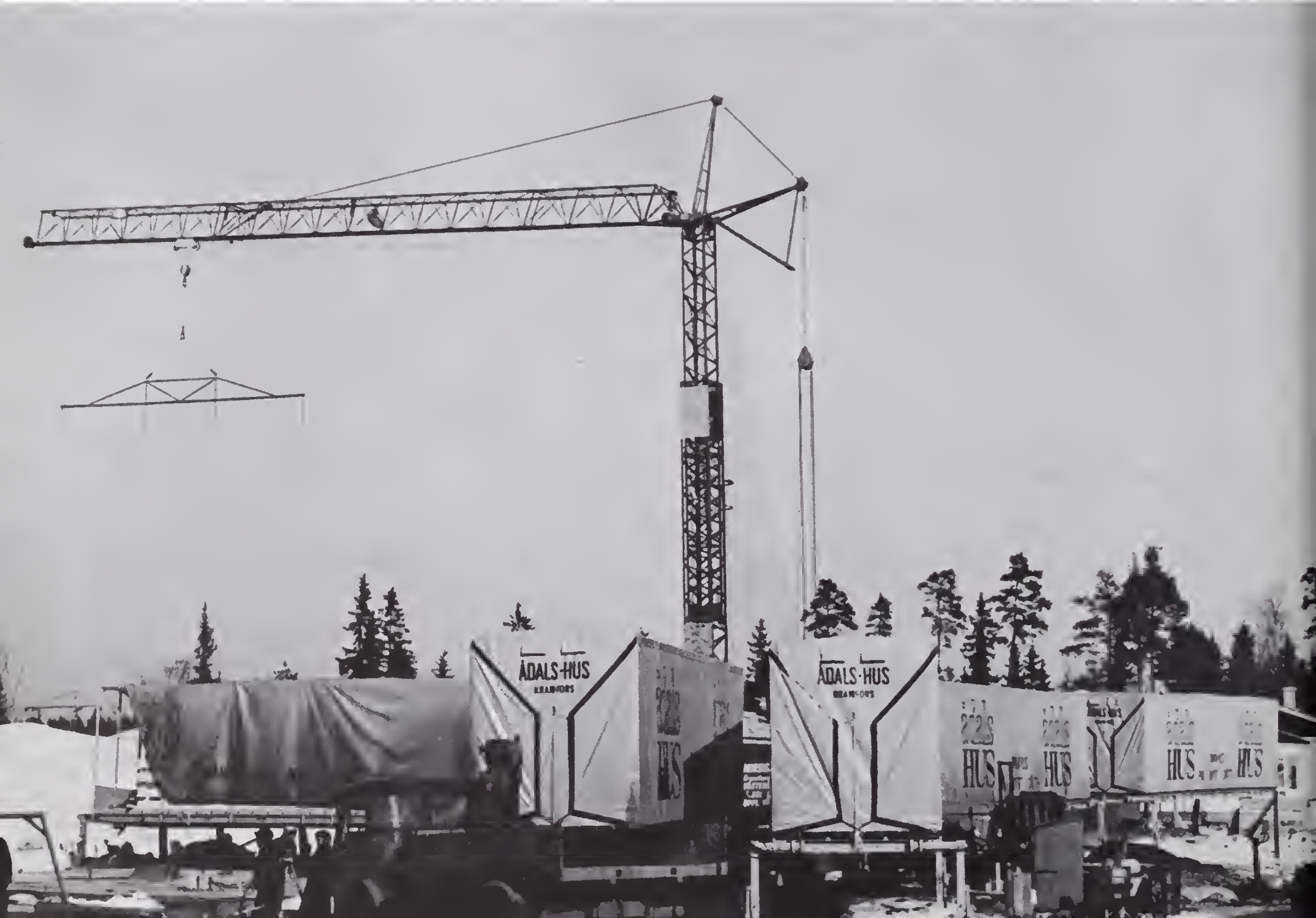
ARKITEKT
BPA-RIKSBYGGEN, SMÅHUSKONTORET

FÖRSÄLJNING
LÄNSSPARBANKEN, STOCKHOLM

- ■ HUSTYP A31, HUS 1^1-8^6
- ■ HUSTYP A38, HUS 9^1-14^7, 16^1-19^5
- ■ HUSTYP D41, HUS 5^1-15^{24}

(Above) Two systems developed and owned by unions in Sweden.

The high quality of workmanship is evident in this parquet flooring which is installed in single-family homes in Sweden. (Top right) A new community near Stockholm has single-family homes, designed to meet governmental architectural standards. BPA is one of the few systems which produces single-family units. (Bottom) Packaged housing units being delivered to site of a union-owned development. Units are produced in union-owned plant.



RNK (Swedish)

This system produces single-family houses, constructed of corrugated steel modular sections that are bolted together on the site. A house is made up of five segments, each of which completes part of the house containing one or more rooms. Painting, wallpapering and interior finishes are usually done at the factory.

The steel modules consist of two corrugated and galvanized steel sections, with rock wool in between for thermal insulation. The external surfaces of the walls and roofs are painted. A ½-inch-thick layer of plaster board is placed directly on the steel for the inside walls. Wood particle boards are used as lining on the studded floor.

The house is constructed in such a manner that natural ducts are contained in the floor, ceiling and outside wall. Heated air recirculates through the ducts, warming the internal surfaces of the rooms. All plumbing is centralized in the same segment.

Erection time is about 3 days, on a previously built foundation.

Siporex-Salemstaden (Swedish)

All floor slabs and walls, and some partitions for the one and two-story row housing in this project, are made from panels of lightweight Siporex cellular concrete, assembled with butt joints.

External walls are 10-inch-thick vertical elements, with a plastic coating applied at the factory. Partition walls are formed by doubling the wall construction, using thinner panels which form an enclosed gap. Clear, span roof sections of laminated wood construction, supplied complete with cemented roll roofing, insulate the dwelling. Opaque, white vinyl film is precut and edged for each room, then stretched into place to form the ceiling. Electrical lines and hot water heating tubes run in grooves cut into the cellular concrete panel surfaces. Plastic plumbing subassemblies include a horizontal plumbing tree for the bathroom.

Siporex units are organic, cellular, concrete panels which are one-quarter the weight of normal reinforced concrete slab, designed for the same spans. Units, up to 25 feet long, can be handled without heavy lifting equipment. The slabs are manufactured in sizes up to 6 by 25 feet. According to the manufacturer, the main characteristics of Siporex are its lightweight, high strength, fire resistance, and high thermal insulation.

The houses of Salemstaden are going up at the rate of 1.6 per day, with a labor force of 90 to 100 men required to put up 300 houses over a 5-year period. Close to 75% of all construction in Sweden uses Siporex. It has also been used in low-cost housing in Mexico, Africa, and South America.

Lightweight, cellular concrete panels being unloaded.

Housing development near Stockholm uses Siporex, a new lightweight cellular concrete.

Skarne S66 (Swedish)

The basis of this system is precast, load bearing, exterior panel walls of sandwich construction, precast floor slabs and columns. By omitting load bearing partitions, this system provides flexibility in the apartment layout within the total perimeter of dwelling. Floor panels come in two sizes, providing a variety of apartment sizes. All of the subsystems are located in an open-chase core wall that forms the central spine wall between two adjoining apartments.

Elements are produced in a central factory off-site. Concrete wall and floor slabs are cast, stored, and generally transported vertically to the site. The floor finish, which can be wood or vinyl, is laid directly on the floor slabs without further finishing. Window frames are cast into the wall elements at the factory.

At the site, the structures are erected from one side of block only. Wall elements are propped with adjustable steel poles until the floor slab is in a fixed position. Joints are grouted as erection proceeds. After the main structural shell has been completed, the non-load bearing partitions, floor coverings, interiors, finishes, sanitary and electrical installations are put in. All interior installations come prefinished from the factory. The floor slabs are free of any installations.

To construct the structural frame for a normal three-story building, containing 12 apartments, requires about 9 working days. Completion time from start to finish is about 2½ months. Under normal continuous operation, it takes about 0.70 man-hours per cubic feet of total building volume to complete the structural frame. Overall labor requirement, during normal continuous production and erection, is 1.2 man-hours per cubic foot of total building volume. This includes all production and on-site operations.

Government and Institutional Policies

Tour members learned that government policies were a determining factor in the development of industrialized building in western Europe. With the large capital investment required to set up manufacturing plants and to amortize equipment, a concentrated, sustained market, guaranteed over a number of years, is a basic requirement in the successful launching of heavy industrialized building operations. It is through aggregation of the public housing market that many western European governments stimulated the growth of industrialized building. It is apparent that systems-building has progressed furthest in those countries which have strong social housing programs, and which offer incentives to builders through a concentration of continuity of demand. Government authorities also offer other incentives to builders in the public housing sector such as low-cost loans, bonuses when the projects come in under the estimate, and the leasing of land on a long-term basis. These incentives have spurred development of the mass production of housing in which labor costs are cut and speed of erection is increased.

Since World War II, France perhaps has taken the lead in promoting industrialized building. Its Secretariet of Housing has used its power to accelerate the growth of assembly-line techniques, allowing the Offices des HLM (Moderate Rental Housing Association) to allot a portion of its housing quota to firms that use industrialized methods. In some cases, local authorities guarantee 1,000 dwelling units a year, for a 5-year period, to firms that meet performance standards at a cost less than 10% of the national ceiling for government programs.

The Italian government, on the other hand, has done little to encourage industrialized building through local housing programs, and the result has been a slow increase in mass production techniques for housing. However, when the Milan municipal administration set a goal of 23,000 dwelling units in high-rise buildings over a 5-year period and offered a 5,000 unit market over five years to firms who could meet the production schedule, five companies set up industrialized building operations to meet that demand. This response illustrates the effect of government policy in stimulating the growth of industrialized building.

The following brief histories of government policies, in the five countries visited by the tour, show that many different administrative techniques and various forms of subsidies are used. One factor is constant: the basic government tool which has spurred the development of industrialized building has been the creation of continuous, concentrated demand through publicly-supported housing programs. The late Henry Kaiser's philosophy for success was "find a need and fill it." One of Europe's great needs was housing after the war. Governments found that, when they organized the market for lower income housing, builders streamlined their production methods and increased their capacities to fill that need.

Besides the effect of government policies on the development of industrialized housing, various non-profit and semi-official housing institutions and associations, such as the internationally known Bouwcentrum in Rotterdam, Holland, have helped the industrialization of the building industries in western Europe. These institutions have conducted research and economic, technical, and sociological studies directed toward improved housing methods. Moves toward standardization in performance requirements of components, in countries such as France, Sweden, England, and Holland, have set the stage for modular coordination in the building industry — a step that will provide for further industrialization, opening up a supranational market for manufacturers.

England

Although England faced a housing shortage, as did much of Europe after the war, systems building made its real entrance in school construction. The British did launch a housing drive in early post-war years in which prefabricated techniques, using concrete, aluminum and other materials, were applied to throw up vast numbers of dwelling units, but the thrust disappeared until the mid-Fifties.

Industrialized building was initiated again in 1955 by the county councils of Hertfordshire and Nottinghams. Their education departments joined together as the Consortium of Local Authorities to form an aggregate market for school construction. This allowed a modular system to be developed to meet the requirements set down under a coordinated school construction program. The CLASP system resulted. CLASP employs a light steel structural system, with a series of different cladding components. About 50% of each building was factory-made. Components were bought in bulk by the authority. Erection time was cut from one-third to one-half that required for conventional methods.

It was in the Sixties that the British government really stepped into the housing arena, establishing the National Building Agency whose principal aim was the encouragement of industrialized building in both low-rise and high-rise apartments. The agency prodded local authorities to cooperate and consolidate public housing markets. Thusly, by 1965, more than 300 closed systems had come into existence. Many of these systems are only on paper, however. Only a few could offer a really comprehensive building package to compete with conventional builders.

According to the Greater London Council, in 1967, industrialized building methods were used to erect some 70,000 dwellings. Five companies constructed 49% of the units. **Engineering News-Record** reports that five companies constructed 50% of the 91,000 public housing units built in 1968. Another 20 companies took 40% of that market and the remainder went to 72 builders.

The government also subsidizes the cost of borrowing money on the open market. In Thamesmead, which will be one of the largest systems-built new towns in Europe, for example, Cubitts, the general contractor, is subsidized for any borrowing costs above a 4% interest rate, a basic rate dating back to prewar days. The Greater London Council has appointed Cubitts as the main contractor in a form of competition. If they come within the contract ceiling, they get their fee. If they produce for less, they get a bonus — another method used by the government to encourage industrialized building.

System building in England suffered its greatest setback with the collapse of a 22-story apartment building at Ronan Point. The corner of the building went down like a deck of cards after a gas explosion on the eighteenth floor blew out one of the load bearing walls. The structure had been built with the large, heavy, prefabricated Larson and Neilson system of precast panels, typical throughout Europe.

After this disaster, the government ordered a halt on all high-rise system building until an independent investigation was completed. The result was an order from the government to strengthen the joints of all buildings over six stories.

Britain is currently pushing for dimensional coordination in the building industry to promote open systems where components would be interchangeable. By 1972, England will have switched to the metric system, offering an encouragement to component manufacturers to standardize products based on the recommendation by the New British Standards. The move toward modular coordination in building stems from studies conducted by the British Standard Institution.

In 1968, England's Ministry of Housing and Local Governments, which is responsible for all public housing programs, mandated that, by 1971, any construction under consideration for a loan from the government would have to meet the metric British Standard for new products and components. Thus, the government is wielding its financial power to develop standardization in the building industry.

Holland

Systems building in the Netherlands was started in the early Fifties when there existed a serious shortage of materials and manpower. But it wasn't until the early Sixties that the government gave it real encouragement through subsidies and other privileges. Local governments now are awarded extra quotas of dwellings if they use labor-saving methods of construction. In order to qualify as a system, a dwelling must be built in less than 900 man-hours of labor.

Out of annual production of about 125,000 units, the government provides 100% government loans and subsidies to local authorities and housing associations for 45,000 dwellings built in the non-profit sector. These are 50-year, low interest loans to cover cost of the building and 75-year loans to cover cost of land. In order to qualify, however, a builder must meet standards set by the government. The government has about 2 billion guilders a year ($500 million) set aside for non-profit housing. In addition to the loans, the government also provides annual subsidies for 4 out of 5 houses to permit people to occupy dwellings where the rent otherwise would be too high. The government considers the annual rent for houses with high interest rates at 10% of the cost, and its subsidy covers half that amount in the first year.

Government subsidies are not only available to houses built with government loans, but also to privately financed houses. The subsidy goes to the owner of the house so that he will offer the house at a lower rent.

There has been political pressure recently for individual subsidies, and the government has promised a small scale, provisional program in the 1970's. Each contractor is allocated a certain quota of the public market. However, if a builder uses industrialized building techniques which lower the manhours needed to erect a dwelling, he may qualify for up to 50% increase in the allotted market.

At present, about 15 factories, representing nine systems, build about 25% of the housing in Holland, according to the Housing Ministry.

The government spends about 10% of its annual budget for housing.

France

Industrialized building in France got its start about 20 years ago when several companies started operating with fixed factories to produce large concrete panels. Traditional construction became more rationalized. The serious housing crisis, which arose after World War II, paralleled conditions in most European countries. But, in France, it was aggravated by the fact that little new construction was completed between 1914 and 1945.

In spite of government programs to meet housing demand, France still has a shortage of housing. Between 1945 and the beginning of 1968, it produced a total of 5.3 million dwellings units. The 1970 goal is 480,000 units.

The general housing policy of France is to improve, or modernize, any buildings which economically are worth preserving, and to encourage increased production of new housing through "reduction in fabrication costs, simplification of standards and procedures, relocation of state aid, and overall reforms of financing."

The French National Building Administration has encouraged private construction companies to speed their erection processes.

The first trial of industrialized building was made in the city of Orleans in 1945, but it met with little success. At that time, labor was still plentiful and wages were very low. In 1951, the Supreme Headquarters for European Construction granted France's **Camus et Compagnie** a contract for erecting several hundred housing units. The firm used a factory-cast, concrete panel system which it had patented a few years earlier. Camus now has 23 factories throughout the world, which produce more than 25,000 dwellings a year (it has an estimated 30 factories in Russia).

In 1953, system building in France got an added boost when **Constructions Edmond Coignet** erected a pilot factory at Evreux. This was the first real application of industrialized methods. Production was at the rate of one dwelling a day. Coignet's development into a fully industrialized system was spurred by contracts from the Ministry of Housing. From simplified site methods used to erect Ministry of Housing Buildings in 1946, the company gradually industrialized its production methods to meet the growing shortages of skilled labor and the corresponding increases in wage scales. Contracts for schools, hospitals, factories, and other structures enabled the firm to develop methods to cast concrete elements with machines.

By 1955, due to the short labor supply and the high cost of construction, industrialized systems could compete successfully with conventional building methods for government housing contracts.

The government in France uses local housing authorities for housing programs. Operating through housing cooperatives, called the Moderate Rental Housing Associations (HLM), they can aggregate the demand and assure industrialized builders of a continuous, long-term market.

In 1950, the Secretariat for Housing attempted to spur productivity by inviting private contractors to submit building systems that would speed the rate of housing production and cut cost. If the system was accepted, it was placed on a list that was distributed to local HLM offices. In this way, builders could compete for long-term HLM contracts.

The Secretariat for Housing took this program another step forward in 1960 by offering added incentive to industrialized builders. It allowed the HLM's to set aside a certain portion of their housing programs for companies who meet large, long-term programs. Competition was tough since the successful company would be assured of a 5-year construction contract to produce about 1,000 dwellings per year. Because highly industrialized building methods normally require capital investment in plants and machine, continuous long-term contracts are a necessity for setting up such operations.

Following this measure, the French government has taken another step which has affected industrialized building. In 1949, the Agrement system was set up. An Agrement is an approval conferred by a national building research institute called the French **Centre Scientique et Technique du Batiment.** It has a board to test and evaluate building products and methods. Board membership is divided equally between government and private industry. Government projects require Agrements, so companies have a great incentive to obtain them. An Agrement for government projects also may determine insurance policies and legal liability for any major defects over a ten-year period. Insurance companies often rely on the Agrement system in evaluating bidders for policies on privately financed jobs.

The government is also trying to simplify contract standards and procedures. The HLM is authorized to contract for housing by mutual agreement, enabling them to overcome a lot of red tape in preparing the documents.

Although the government housing programs are intended to entice industrialized builders into the low- to moderate-income housing market, French systems builders are turning more and more to the private market where fatter profits are possible. Many companies feel that, because government apartment complexes are often broken up to small lots, the contracts are less attractive. Also, under government programs, builders must operate under a ceiling of about $9 per square foot. In the private market they can go as high as $18 per square foot.

Today, industrialized building accounts for about 40% of annual construction in France, according to the **Syndicat National**

Du Breton Arme et Des Techniques Industriales, while other sources indicate about 30%.

Italy

Systems building in Italy lags behind most European countries and Italy probably will be the last western European country to adopt it widely. The federal government in Italy has given very little impetus to industrializing the building industry, despite an urgent need for low to middle income apartments. The Italians seem reluctant to change from traditional craft-oriented construction. Developers and architects seem to resist any standardization of construction.

At present, about 5% of all building starts in Italy are systems building. Although there are three government holding companies that are now launching industrialized, prefabricated, component construction, whatever initiative there is in systems building has come from private companies such as MBM-Balency.

Estimates in cost saving, using industrialized building, is about 10% to 15%, but, for the average apartment house buyer, this saving is not a major inducement. Prefabrication is often synonomous with shoddy workmanship in the average Italian's mind. (There is a similar attitude in the U. S.)

Time savings in the range of 50% tc 66⅔% are beginning to overcome the obstacles to system buildings, especially for commercial buildings, schools, factories, and hospitals. However in the housing area where the work is split between so many companies, less than 2% of the apartments are constructed with systems building techniques. About 10 companies build 5,000 apartments a year using industrialized methods. They are almost exclusively reinforced concrete panel and slab systems.

The move toward greater prefabrication and industrialization may be speeded up over the next few years, however. The number of masons, which are the backbone of the Italian construction industry, is rapidly diminishing as the younger generation looks to new trades. Wage scales for skilled building trades workers also are increasing rapidly. These conditions may reshape the thinking of the housing industry and speed industrialization as the housing industry looks to quicker and more efficient construction techniques.

Sweden

Swedes have been faced with a housing shortage for a number of years despite the fact that their country was not a belligerent in World War II. Sweden now is building more housing units per capita than any other country in Europe. In the past few years, new housing starts have ranged from 90,000 to 106,200 annually in multi-story, one-family and two-family structures. However, in 1968, of a total of about 105,000 new starts, about three-quarters were multi-family dwellings. The Swedes remain a nation predominately of apartment dwellers.

Industrialized building, as a concept and a goal, is nothing new to the Swedes. As far back as 1955, contractors were using prefabricated elements on a large scale. The chronic housing shortage in this country has helped encourage industrialization of the housing industry. In election campaigns in 1969, one of the major planks of the Social

Democratic Party, which has ruled Sweden since the early 1930's, was the commitment to move into industrialized building.

In 1946, the Swedish government outlined general aims of its postwar housing policy, which is planned and supervised by the Royal Housing Board. This board collaborates with municipal agencies and local government authorities and is responsible for granting government loans and subsidies for housing construction.

The Swedish housing policy since World War II has been three-fold: elimination of overcrowding in cities due to the increasing urbanization of the population; the elimination of substandard housing through a program of extensive urban development; and the reduction of rental to a point where a family would not pay more than 20% of its income for a modern dwelling unit.

The present housing policy rests on a division of responsibility between national and local governments. Local governments must take the initiative to insure that, with the resources available, there is an adequate supply of housing in their area of jurisdiction. They establish municipal and non-profit real estate companies directly subordinate to them. Programs often provide assistance to private companies, particularly for building small one-family homes. Local governments also buy suitable land outside their boundaries and assign it to private companies at reasonable terms. Stockholm, for instance, leases out land acquired by the city on 60-year to 100-year leases. Also local governments either provide construction capital to builders at very favorable interest rates or guarantee loans obtained on the private market.

Housing is built by three different types of developers: private companies, two national cooperatives, and by communes. Private companies are responsible for 40% of the housing market. The cooperatives, one formed by the Tenant Savings and Building Society, the other by the Builder Workers Union, are responsible for 20% of the housing. Communes produce the other 40% of the housing, about one-half of it multi-family units.

In Sweden, the builder of housing usually has to provide only a small portion of the capital, most of which is borrowed. All types of credit institutions participate in financing housing. Initially commercial banks provide short-term building credit which must be repaid when the structure is complete. Then a credit institution grants mortgages, which usually have a 60-year amortization period. The mortgage banks, special housing credit societies, mortgage companies, and leasehold credit associations acquired their funds through the issuance of bonds on the open market. Pension funds, insurance companies, and other institutions will buy these bonds as investments.

In the early Sixties the government stepped in with direct subsidies for plant equipment used to produce building elements. The subsidies were originally earmarked only for industrial machinery. The Royal Commission says that, at the time, the half-dozen plants in operation were closed systems in which the elements are only compatible within the system. The goal of government people interested in industrialized building is to develop "open" systems or systems that can take competitive bids on elements or subsystems from other manufacturers.

In 1966, the government instituted a system of granting 5-year guarantees on loans (against the normal 2-year loans) for buildings that met certain industrialized building standards. Projects had to have at least 1,000 apartments and would have to use industrialized techniques. It was hoped that 10,000 apartments a year would be built under this program, but it has not made any significant inroads into getting builders to use new techniques.

Standardization is vital in aiding the development of systems building. The Swedes have highly standardized the industry as far as measurements go, at least in comparison with the U. S. Although the standards are set by an organization within the building trades association, and compliance is voluntary, most builders comply for the sake of economy. Doors, ceiling heights, windows, plumbing fixtures, kitchen equipment and cabinets, and to a large degree, room dimensions have standard sizes.

According to the Royal Commission on Industrialized Building, systems building techniques in Sweden find greater use in industrial buildings than in housing. They estimate that about 80% of factories are built with a high degree of prefabricated elements, 60% of office buildings, and 30% of the schools. Of the 100,000 apartments being built per year, the commission estimates that 30% to 35% are built in what can be called industrialized building techniques. At least 50% of single-family houses are built using prefabricated techniques, but whether this can be considered industrialized building is open to question. There is a tremendous variety of systems and types. Most of the projects are for less than 50 homes, of one type, in an area.

In one Royal Commission study they offered this comparison between various kinds of building techniques.

1.1 man-hours per cubic feet for system building

1.7 man-hours per cubic feet for rationalized building

2.0 man-hours per cubic feet for traditional construction.

Bouwcentrum

The **Bouwcentrum** is a non-profit institute centered in Rotterdam whose objective is "the promotion of optimum decision by means of an indirect influencing of building on the basis of the results of scientific research." It serves mainly as an information and research center, covering all the social, technical, and economic aspects of the building industry.

The sensitivity of the **Bouwcentrum** to the problems of housing the poor and the disadvantaged can best be illustrated by its description of its aspirations: " . . . however, a balanced development does not only rest on economic development, on employment, the rise of productivity in production and quality control of products; it is based also and particularly on the future of the environment in which man lives with his family, on the dwelling, the schools, the shops; on health care and socio-cultural accommodation, on easily accessible areas for open-air recreation in the evenings and weekends. If we are to induce worldwide development of such scope so that the more than 200 million families may be freed from their life without prospect in decrepit slum dwellings, so that for them one of the most important Human Rights, which after all were signed by all nations, will be realized, then indeed we shall have to build much more than that. If we want to create a really habitable world for all, then the potential pluriform culture of life in our rapidly growing cities and the easy accessibility of recreative nature must be democratised; this means not only more, but also better building in a society with a building policy that is directed towards the highest aspiration of man. The central, regional, and local authorities must not only realize a balanced development policy, they must also through their building policy promote continuity, simplification, standardization, research, and transmission of knowledge in the field of building."

The history of the **Bouwcentrum,** now recognized all over the world, had its roots in the formation of a specially created private documentation bureau in 1942 that operated unofficially since the country was still occupied by Germany. The bureau, working closely with Netherland authorities and the building industry, gathered data for a postwar reconstruction plan for what they hoped would be a liberated Holland. The activities of this bureau produced a building plan for 1946 for the Netherlands. The **Bouwcentrum** was founded after the war in 1946, and moved its own headquarters in 1949. Prior to the formation of the **Bouwcentrum,** a number of initiatives were undertaken in the Netherlands to focus on the building problems:

- In 1944, the Ratiobouw Foundation was formed to promote the rationalization of the building industry through research in technology and industrial organization.
- In 1943, the Institute for Practical Management held the first lecture on Organization of the Building Industry.
- The initiation of a publication, called **Bouw,** for the building industry, which was to address itself to the social, economic, function, architectural, technical, and management problems of the building industry.

When the **Bouwcentrum** opened a second building in 1955, all these activities were housed under one roof.

Bouwcentrum is a unique organization in the building industry. It regards a building as "the creation of a combination of spaces in which an aspect of human life, functionally integrated must be given scope for development." Its research activities, into all social, technical, and economic aspects of the building industry, form an integrated approach to housing production and influence the quantity and quality of housing production in the Netherlands.

In the area of functional research, **Bouwcentrum** initiated a study council made up of home economists, architects, engineers, sociologists, public health specialists, psychologists, statisticians, and representatives of various institutions to develop standards for the spatial requirements of housing. After interviewing 2,000 Dutch families, it came up with the basic set of data that determined user requirements for the various household functions, such as food preparation, cleaning and maintenance, etc. On the basis of this data, a group of young architects designed "everyman's dwelling of tomorrow." In 1965. the Netherland government revised its standard for designing dwellings, taking into account the findings of the user study.

The technical research of the **Bouwcentrum** includes the evaluation of building systems for the Netherlands government. Laboratory tests are done by the National Council for Industrial Research. Until 1967, the institute had assessed some 650 building systems of which they found about one-third acceptable. These systems have accounted for about 10% of all post-war housing construction in the Netherlands, according to the **Bouwcentrum.**

The **Bouwcentrum** has also developed a set of guidelines for town planners and architects to obtain industrialized production on the building site. Its research has been applied by the Netherlands Ministry of Housing which awards an extra quota of dwelling to local governments on projects where there is a reduction of man-hours for building construction. This step has done much to promote industrialized housing construction in the Netherlands and to increase the housing production in the Netherlands. From 1962 to 1967, production increased from 78,500 units to 127,500 units or more than 60%, according to the **Bouwcentrum.** At present, the Netherlands is producing about 125,000 units, according to housing authorities.

Building teams, which have started a housing project, can ask the **Bouwcentrum** to evaluate their plans from a functional, technical, and economic point of view, through a method the **Bouwcentrum** calls x-raying. In addition, the institute has set up a developmental group which has developed a low-cost apartment to be constructed in multi-story buildings, which meets the financial ceiling set by the housing authorities. About 3,000 of these apartments are being constructed. A second group is working on a low-cost, one-family dwelling.

The **Bouwcentrum** also organizes courses, open to building teams from any country in the world, to work with its experts in developing actual housing projects.

Agrement

The problems involved in introducing new materials and systems for housing is one faced by the construction industry in every country. Of paramount concern is the protection of the people against unsafe materials and poor designs. However, any controls must be flexible enough to encourage new developments and innovations in buildings while simultaneously protecting the health and safety of the community.

One such system is the Agrement, a nationally recognized approval system of testing and certifying building materials, which operates in slightly different forms in France, Holland, Italy, England, Portugal, Belgium, and Spain. In many countries, the state contributes to its operation. It is most advanced in France where the state contributes 50% to support the **French Centre Scientique et Technique du Batiment,** which confers the Agrement. A board, made up of representatives half of which are from government agencies, the other half from private industry, judges the building product in terms of safety, habitability, durability, and quality control. The board of experts usually visits factories and sites and conducts tests of the product under special conditions. The board also consults with experts in different fields to review the evidence provided by the firms on the new product.

The Agrement is thus an impartial evaluation of the product and can be useful to local authorities, architects, builders, insurance companies, and the manufacturers of the new products. For government contracts in France, an Agrement is essential.

■ New towns

The rapid growth of urbanization in western Europe has prompted many governments to adopt national policies aimed toward the creation of new towns, which are usually developed within the framework of tight land-use controls. As cities continued to grow and become overcrowded, the government intervened to try to avoid the traditional urban sprawl, common in the U. S., by establishing new towns as attractive alternatives to overcrowded cities. Because many new towns are being developed under government initiative, they offer the large concentrated market which is attractive to systems builders. England and the Netherlands along with Sweden perhaps have been the leaders in new town developments. Great Britain already has 25 new towns. Thamesmead, which was one of the new projects in progress visited by the tour, will be one of Europe's largest systems-built new towns when it is completed.

Holland, faced with serious space problems, is reclaiming land that has previously been under water. It is developing four new towns that will be built largely with industrialized building systems. The tour visited one of the new towns, Lelystad, which is on land reclaimed from the former Zuider Zee. Here the Vaneg system is being used to build attached, single-family dwellings in the village of Dronten.

Surrounding Stockholm are a series of new towns, such as Vallingby, that will eventually house about 250,000 people.

Although not a new town but rather an urban renewal project, La Defense is taking shape within the city of Paris. However, this development will be more than just a bedroom community. It will be more like a satellite city or new town within the city of Paris.

Government land-use policies and controls have played a major role in influencing the development of new towns. In many countries, such as the Netherlands and Sweden, local authorities can purchase land and lease it back on a long-term basis to individuals or non-profit building societies for residential construction. In Stockholm, for instance, the city began purchasing land in 1904 to expand and protect the areas surrounding the city. Much of the land has been leased back to housing foundations to develop new towns. Amsterdam does essentially the same thing, buying land based on agricultural value and leasing it back for new town development. In this way, land speculation is controlled.

In all of the new towns visited on the tour, the government has some type of subsidy, either directly to the tenants or in the form of low-interest loans to the builder to provide housing for lower income families. In La Defense, for example, the aim is to achieve economic integration in much of the housing. It is planned that apartments will be open to families of low- and moderate-income levels with subsidies provided according to family income. In Thamesmead, the Greater London Council is striving for the same economic and social integration in the residential area.

Except for Vallingby in Sweden, all the new towns visited on the tour are planned to be self-sufficient communities offering jobs as well as a wide range of community services and recreation area. However, public transportation systems and links to the larger urban areas are still an integral part of the master plans for these towns.

All of the developing new towns, seen on the tour, have well conceived master plans. How they actually improve the quality of life will be determined by the eventual residents. The description of Thamesmead and La Defense that follow will illustrate the approach now being taken in England and France.

La Defense

The urban project being developed just two miles west of Paris' famous Arch of Triumph is part of the French government's attempt to cope with the rapidly expanding western suburbs of Paris. It is planned as a mini-city that includes a 250-acre business community, a 1,700-acre residential sector and a 15,000 student university along with schools and other community services.

The first phase of the satellite city, which includes the business district along with 5,000 low-rise dwellings, is rising above a huge underground transportation center that will serve as an interchange between subway, bus, and automobile traffic.

The **Quartier de La Defense** project got off the ground in 1958 with the government setting up the Agency for the Management of Defense (EPAD) to organize the project. EPAD's planners, architects and engineers developed the multi-level plan for the business sector, with an elevated platform to serve as the main floor entrance level for the apartment and office buildings. Beneath this will be various levels of roadway, parking areas, and what the French claim will be the largest bus terminal in Europe, serving 40 lines, and the subway station for the Paris Regional Express line.

EPAD started off with a low-interest loan from the government to purchase land and to construct the roads and the platform. They will sell the air space in the business district to private developers to erect office buildings according to the master plan that has been developed.

Price tag of the residential sector has not been firmed up yet, but the business section will cost an estimated $450 million.

Included in the urban project is a special program to rehouse migrant families from the surrounding decayed neighborhood. About 15% of the new buildings will be government built under social housing programs. Along with these buildings will be schools and other community services. EPAD is striving for complete economic and social integration within the residential area.

Thamesmead

England, a pioneer in new town development, began its program after World War II in an attempt to disperse a growing London population, mainly workers from the industrial cities in the north. The results were not always model, integrated, or well-planned communities. Instead, many of these new developments became concentrations of lower income or working class families with relatively little economic or racial integration. The government developed a green belt around London through the application of strict zoning laws with the new town taking the spillover from London's growth.

However, recent years have brought an evolution in the British policy of developing new towns, bringing their development under an overall land use policy and broad national planning policies. Now new towns often serve as showcases for new methods in industrialized building techniques since much of the rental housing is built by local government under subsidized national housing programs and builders can be assured of an aggregate market. An example of one of these new towns is Thamesmead, a $450-million new town that will house 60,000 people within Greater London. Thamesmead is under the auspices of the progressive Greater London Council, which is a governmental regional planning agency that has the power of eminent domain. One of the unusual features in building the town is the encouragement of the maximum use of industrialized building methods.

The site is about 8 miles from the center of London, in a flat marshy area with about 3 miles of land along the river. The scheme, upon which the town is to be developed, was conceived by the Greater London Council's own architects, headed by Hubert Bennett. According to the Greater London Council, the principles on which the design scheme is based are:

"First, Thamesmead will not be a dormitory area, it must provide a complete environment with employment and full educational, communal, commercial, and recreational facilities.

"Second, the Housing will be a relatively high average net density of about 100 persons per acre, but within this as many families as possible will have gardens or outdoor living space. Density will be used as a design tool and will vary from housing areas with large family dwellings at 70 persons per acre to parts where the density will be about 140 persons per acre, and provide dwellings for small families and single persons.

"Third, movement about Thamesmead for both pedestrians and vehicles will be along routes carefully designed to be safe and convenient. Communication between the new development and the neighboring area of London has been planned to assure that the development will become integrated as part of the Greater London.

"Fourth. It has been accepted that landscaping makes a major contribution to the quality of urban environment; thus the design of buildings and open space have been considered as a single design problem."

What is resulting from these principles is an esthetically pleasing, well-planned community that combines a wide, architectural variety of housing structures combined with open spaces, recreational areas, shopping center, offices, and community services.

As was indicated earlier, the Greater London Council is making maximum use of systems building. More than 3,000 of the 4,000 planned dwellings will be built using the French Balency system. The council is working under value-cost contracts which encourage the builders to keep costs down and production up. If the contractor's costs go up, his fee goes down or conversely, if the cost of the structure goes up, the fee is reduced. The first $84 million contract has been awarded to Cubitts Ltd., and Holland & Hannen, both of London. An on-site factory is now producing the concrete sandwich panels that go into the structures.

When Thamesmead is complete, it will be a fully homogenized community housing people from the lowest economic level to the top. About 50% of the housing will be privately built and sold on the open market. "We hope to have residents here from the humblest, unskilled workmen to the professionals," a spokesman for the Greater London Council indicated.

THAMESMEAD
A community of 60,000 people planned by the Greater London Council in cooperation with the London Boroughs of Bexley and Greenwich
stage 1
stage 2

(Next page, top left) A main thorofare. Vehicular traffic is separated from pedestrian walkways. (Bottom left) Built-in garages and pedestrian walkways. (Top right) A row of town houses was among first units completed. They illustrate that design does not have to be sacrificed with increased density. (Bottom right) A town house complex, showing common walkways and the manner in which living units are separated to insure privacy. (Page 70, top) The international award winning new town of Thamesmead utilizes the Balency system. New concepts in planning, living styles, architectural design and system capability are in evidence. (Bottom) New concept in shopping plazas. The low walls surround openings to parking area which is on a lower level. Housing units, with individual patios, are adjacent to the plaza, creating a sense of community.

Constraints to Industrialization in the U. S.

Industrialization of the U. S. building industry is, for the most part, still in the infancy stage. Prefabrication of components is an accepted practice and systematized on-site construction processes have been developed over the years. But the concept of a single management organization controlling marketing, financing, development, manufacturing of components, erection, and the delivery of the building is only beginning.

One of the highly industrialized segments of the U. S. building industry is the mobile home producers who produce about 400,000 units a year. President Nixon is now looking to this sector of the building industry to supply 4 million of the 26 million units that Congress set as the nation's goal in 1968. The mobile home producers have the potential to convert their operations to modular units.

The slow development of industrialized building in the U. S. is not due to lack of technology. According to Battelle Memorial Institute, design, materials, equipment, and techniques are about 10 years ahead of the building industry as a whole. The constraints that impede the industrialization of the housing industry are mainly institutional constraints that have been a formidable force in preserving the status quo. The primary ones include:

- Restrictive zoning practices and poor land-use policies
- Archaic building codes
- Protectionist union policies
- Financing and supply of money
- Lack of consumer and industry education.

These constraints to industrialization have been major barriers to the development of increased production methods in the U. S. to meet its critical housing needs. For the current fiscal year ending June 30, 1970, production of conventionally-built, or rehabilitated units, is expected to be 15% less than last year's total. It also is expected to be 30% below the goal set by the 1968 Congress.

In preserving the status quo of what has traditionally been a "lily-white" housing industry, building constraints have served to keep minority groups from producing desperately needed new housing. As a result minority communities have been denied the economic benefits and opportunities which are generated in that production. Minority demand to be included in the operation and administration of industrialized building systems, as they develop in the U. S., motivated the NAACP-sponsored European tour. Overcoming the constraints that impede industrialization and other opportunities in the housing industry in the U. S. are all the more crucial to their stake in this operation.

Most European companies indicated that the prime requirement to industrialized housing production is the aggregation of a large concentrated market which can guarantee sufficient demand, over a certain number of years, to justify the capital investments that mass production processes require. Aggregating the market depends on overcoming all short-term and long-term constraints. Three avenues are open to provide a market for industrialized building operations in the U. S., according to John Eberhard, Dean of the School of Architecture and Environmental Design at the New York State University at Buffalo. First, new towns can be developed. Second, new agencies can be developed to aggregate the demand. Third, the government can use its influence with public housing programs, as has been done in many of the European countries visited on the tour.

In the U. S., the existing market is created by the individual's demand and his corresponding ability to pay. Those in disadvantaged positions, mostly members of minorities, have their housing need overlooked except for token efforts by the government. Collectively the middle class and the affluent have dictated market conditions and the building industry has organized to meet only this demand.

Organization of the housing industry's sequential process of construction, which has resulted partly from a fragmented market, is not conducive to any innovations. On a typical job, a rather loose combination of independent companies get together to design and construct a building. Each is interested in its specific consecutive function within the total job. When the work is complete, the team is dissolved.

Systems building, on the other hand, means that all of the building disciplines are involved as a team in all phases of the construction process. Innovations, therefore, can be evaluated in the context of the total project.

The European approach to systems building, as evidenced by many of the companies visited, involves vertically integrated firms that handle all of the traditional roles that go into producing housing. They incorporate the architectural design, the engineering, the construction and also the financing and the development, in many cases. The total building process is controlled by a single management from start to finish. Therefore, the company is concerned with implementing any innovations, whether hardware or software, that can streamline their operation and make it more efficient.

The objective in industrialized building is a tight management structure that controls all of the various inputs that go into construction. Within the framework of the U. S. building industry, this may require new consortiums of developers, architects, engineering firms, builders, and material suppliers, or the formation of new companies that incorporate all these disciplines. However, until there is a concentrated, guaranteed, identifiable market, there is no incentive to change the fragmented structure of the housing industry.

The fragmented market and the corresponding fragmented setup of the housing industry result, for the most part, from nonuniformity in building requirements throughout the U. S., restrictive zoning, union practices, and the financial setup of industry. In housing, the obstacles to mass production are nurtured also by the traditional "American dream" that everyone should have his own plot of land with his own individual home. This was possible in a rural society with few people and a lot of land. However, today, 75% of U. S. citizens live in urban areas. The population in the U. S. is growing faster than the housing supply, and the American dream has turned into a nightmare for most of the disadvantaged. Consumer education, therefore, becomes a prime requisite for industrializing the U. S. housing industry. Producers must convince the U. S. population that factory-production does not mean shoddy construction. Lower income families may be the hardest to convince. They tend to measure housing quality by the housing choices of the affluent.

A single-family home on an individual plot of land also cannot provide the social amenities that families really want. On the other hand, cluster housing and planned unit development, which is conducive to industrialized building, allows the development of community parks, recreational areas, and other services that provide a social environment necessary to improve the quality of people's lives.

One of the government's first attempts to overcome the constraints to systems building is its "Operation Breakthrough" program. According to HUD, "Breakthrough" refers not to a technological breakthrough, but to an attempt by the federal government to penetrate and eliminate institutional constraints which have impeded the mass production of housing. The first phase of the program includes the design and planning of prototype housing, using building systems on 11 sites throughout the country. This will be followed by actual construction of prototype housing for evaluation and testing. Whether or not the program will have a lasting effect on the way U. S. produces housing will depend upon the program's ability to permanently overcome the constraints to new systems of housing and upon the ability of HUD to help aggregate a large enough market for housing producers to justify capital investment for mass production. Many critics indicate that unless the government is willing to expand and develop new housing programs this last phase will fail.

Minority groups have a vested interest in seeing this program work. If "Breakthrough" succeeds in overcoming housing constraints, there will be a new housing industry in which minority groups demand a part. Not only can they look forward to economic advancement and new business opportunities, but to badly needed new housing for their families as well. Overcoming primary constraints is crucial to the industrialization of the U. S. housing industry. Industrialization is the only way to meet one of our nation's worst domestic crises, lack of adequate housing.

Building codes

Although building codes in the U. S. are constitutionally the state's authority in the U. S., most states have abdicated this power to the local communities without controls over abuses or regional needs. These communities rarely have real building code expertise. Consequently, decisions at this level often fall prey to backyard politics, proprietary interests, and simple ignorance. The result is a patchwork quilt of often archaic codes, with little uniformity from one community to the next. Such non-uniformity of building codes fragments the market for housing, making it economically unfeasible for housing producers to industrialize their operations.

Under present legislation, the federal government can exert only indirect influence through such agencies that control government construction or through financing of building programs, although it has tried various schemes to encourage states to reassert their code-making authority. Although there are also four national model codes sponsored by the American Insurance Association and three organizations of local building officials — International Conference of Building Officials, Building Officials Conference of America and Southern Building Code Congress — most communities that have adopted them have done so with substantial modifications. Many states also have model codes which communities may adopt. But the large cities feel they have the resources and expertise to develop and enforce their own standards. Rarely have they adopted the state codes. Added to the many sources of codes are special authorities and school districts which have been able to develop and enforce their own standards. Estimates indicate that over 12,000 jurisdictions have their own building codes.

With this patchwork of codes and standards throughout the U. S., housing producers either can meet individual requirements on a custom basis, restrict their operation to areas with identical requirements, or meet the highest standards. Since industrialization is effective only with large-scale production serving the widest possible geographical areas, housing producers have found it more economical to operate with the traditional time- and cost-consuming construction methods.

Some states have begun to reclaim their code authority. Ohio and California have adopted state codes for industrialized building that supercede local codes.

There is also a move toward performance codes, which specify the function a material should perform rather than the material itself. Performance codes are the only codes that can readily adapt to new technology and materials. But there is little agreement over what the standards should be in terms of function. Nor is there centralization of testing. The U. S. conspicuously does not have any organization resembling the Agrement system that serves to give national standards.

Mass production of housing needed to meet national goals will continue to be hamstrung in the U. S. unless some uniformity in building codes is obtained.

Zoning and land-use

Like building codes, zoning is also constitutionally a state right. But it also has been delegated to local communities where, in fact, it has become the last legal means of housing discrimination against minorities and the poor.

In suburban and outlying areas, communities continue to zone for large lots of one acre or more which make inefficient use of land. They also exclude or otherwise restrict the building of multi-family units. What results is the traditional checkerboard pattern of single-family-housing in industrial plots of land. Few members of the minority community and other working class families can afford to buy or rent such housing.

Low density zoning is a double-edge sword working against industrialization of the housing industry and against poor and minority families. Mass production techniques for producing housing are most efficient for multi-family dwellings such as townhouses, garden-type units and low-rise or high-rise structures. Zoning fragments the market, making it economically unfeasible for large-scale housing production and new planning concepts.

Too often land planning is also protectionist in nature, aimed at preserving questionable individual rights or local community exclusionary aims. Land-use planning rarely goes beyond the local communities and is not tied to any regional plan. The federal government so far has failed to enact a national land-use policy.

One method to override the problems of both zoning and codes is the creation of state governmental agencies such as the New York State Urban Development Corporation (UDC). This agency has broad powers to finance housing, the power of eminent domain, and the right to build anywhere, overriding local building codes and zoning restrictions. The agency also encourages new technology and materials, exploring systems building, testing, and the possibility of prototype buildings. This is one way for states to counteract local barriers to innovations in construction.

Other approaches being considered at the federal level include legislation banning discrimination against federally-assisted housing. The "stick and carrot" method of administering HUD programs is being advanced presently by administrative edict and legislative proposals.

Lawsuits challenging the constitutionality of exclusionary zoning are being mounted by civil rights groups such as the NAACP.

Unions

The union problem exists on two levels, national and local.

The Building and Construction Trades Department of the AFL-CIO, which represents the various craft unions at the national level, has vowed not to stand in the way of progress. Many national union leaders have come out strongly in favor of industrialization and new technology in the construction industry.

Such goodwill, however, often breaks down at the local level. Traditionally, each of the craft unions has sought to provide its members with decent wages and to protect their specific skilled crafts. If there is an over-abundance of building in an area, with a corresponding shortage of skilled tradesmen, the union is not likely to protest the use of unskilled labor in industrialized housing plants, especially if it would provide year-round work. However, in view of the union's self-protective policy, it would object to replacing skilled tradesmen in the field with unskilled labor in the factory if it means putting their membership out of work or forcing them to lower paying, albeit year-round jobs.

Complicating the problem, and of particular concern to minority groups, is the fact that many craft unions traditionally have resisted admitting minority group members into their ranks and so have remained "lily white". Direct federal pressure is helping to alleviate this situation now, but the direct effect of such efforts is still largely token.

There have been some agreements made between housing producers and craft unions on regional and local bases. However, local leaders will only agree to cooperate if they find it advantageous to do so. Many see no advantages to industrialization and can effectively stop any progress in their individual areas.

Industrialization of the building industry could open up new job opportunities for minority groups. Unskilled labor within the community can be trained for factory jobs. Skilled people can hold down management and administrative positions. Also minorities can also find new opportunities for entrepreneurship in the new industry.

However, the labor union problem will have to be solved before any large-scale industrialization of the housing industry can occur.

Financing and the supply of money

Financing and the supply of money acts on two levels to impede the growth of industrialized building. It affects the producer and the buyer or renter, who make up the market.

Historically, in the U. S., the housing producer works on low capital investment. He borrows money to construct a building and must sell it before he gets any return. Construction loans usually are relatively high priced and dependent upon the prime interest rate, which has been rising over the years.

To industrialize housing production requires high capital to set up plants and tool operations. In Europe, investments of $100,000 or more for on-site plants, and as much as $3.5 million for central plants, were needed. Industrialization also requires research and experimentation, both of which require additional capital. Most of the companies in the housing field today are small and unable to raise the needed capital to justify this move.

Therefore, new firms that can raise the necessary capital may have to enter the housing market, or the government may have to use its influence to open new lines of financing for the building industry to industrialize.

On the second level is lack of ability on the part of the renter or buyer to pay for the housing once it is constructed. As most building experts agree, there is no such thing as housing which is low cost to the producers. To produce dwellings which lower income groups can afford requires subsidies either to the owner, to the producer, or to the occupant. Since it is estimated that 6 million of the 26 million dwelling units needed by 1970 are in the low- to middle-income range, it will take some type of expanded government or private subsidy to convert the crucial housing need to an effective consumer market.

Lack of consumer education

Educating the consumer to accept industrialized housing is another constraint that systems builders will have to face in the U. S. In the minds of the average American, mass production and prefabrication usually means shoddy workmanship and look-alike housing. While the age-old American dream of the single-family home on the individual plot of land has never materialized for most of the disadvantaged minorities, the dream still persists.

If industrialized building is to succeed, the producer will have to be concerned with more than just providing a house. Well planned new developments that provide attractive, well designed, clustered, low-rise dwellings with community services, and recreational areas will do much to overcome the bad image that prefabrication has in the U. S.

■ Impressions of tour members

The general impression of the tour members was that the concept of mass producing housing, and the industrialized techniques, can be adapted to meet the housing needs in the U. S., especially in low to middle income areas. As anticipated, however, the systems, they felt, needed many modifications to meet building codes and life styles in their communities.

For many people on the tour, this trip was the first time they were able to see, first hand, the application of assembly line techniques for the production of housing. Since the group represented a wide scope of professional interests and community associations, tour members viewed the systems and the European developments from a variety of perspectives related to their own experience in the U. S. building industry and in their communities.

From an engineering point of view, Marcus H. Ray, Chief Engineer with the contracting firm, F. W. Eversley & Co., Inc., of New York City, said, "I was surprised to learn how each system could be broken down into easily executed steps, many of which can be performed by relatively unskilled labor. The basic technical concepts are straight forward and easily grasped by personnel familiar with conventional building techniques. The general contractor will not have to go through an expensive re-education process to use systems techniques."

This view was echoed by another tour member, Rebecca Williams, an Urban Development Specialist with the Model Cities Programs of the U. S. Department of Housing and Urban Development's New York regional office. She indicated, "From a manufacturing standpoint I found it unique, yet simple, and easy to duplicate in the United States."

George Crank, a lawyer and general counsel of the National Association of Real Estate Brokers (Realtist), pointed out what he felt were the advantages of the systems techniques seen on the tour. "The foreign systems methods and types of housing provided an insight on how factory-built housing could provide housing faster, at a lower cost and in greater volume for this country's low- to moderate-income segments of the population. The ability to prefinish units on the ground using industrialized assembly line techniques not only allows for substantial savings potential, but also provides quality control and minimized material waste."

Tour members were confident that the U. S. and its minority community not only could use, but could improve upon the industrialized housing techniques that they had seen in Europe. "I see the potential for producing a great number of units in a relatively short time and the impact that this will have on a particular area and its population. I think that we could industrialize the process more effectively in the U. S. and do a better job," said New York City's Jim Solar, Director of Housing for the East Harlem Interfaith Housing Office. His view was shared by Marguerite Evans, Vice President of the National Housing Producers Association, a builder and President of the Marlo Land Co. and T.U.L.C. of Detroit, who said, "I think we can take what we've seen on this trip, such as the on-site factories, and combine them with our own expertise and come up with meaningful housing programs for our communities."

Leroy St. Julian Gaillard, Chairman of the Board of Directors of the Afro-American Builders Corporation, of Alabama, felt "half a dozen or fewer men could get together and create even better systems than we've seen on the tour, but you've got to consider the mechanics from the standpoint of money and equipment."

Most tour members felt that no one system that they had seen was the complete answer to housing needs in the U. S. "There are several ideas which could be adapted, and just about every system has something of value which could be used but there is no one system that has the answers to all our problems," pointed out Cornelius Cummings, Contractor and President of Cummings Contracting, Inc. of Rochester, New York.

Contractors and engineers on the trip were particularly concerned with the system meeting building code requirements in their areas. "As far as I can see from what I've looked at in Europe, the U. S. has the technology and has had it for some time in the field of prefabrication. Actually, what keeps it from working in our country is that the building codes will not allow some of the concrete construction that they have over here. Plumbing, electrical, and heating codes in the U. S. are very strict," indicated Bill Boyd, Contractor and Director of Rehabilitation of the Community Renewal Foundation, Inc. of Chicago.

From a technical view, Marcus Ray noted that some of the European systems offered "insufficient structural rigidity in some concrete panel systems and non-durable interior finishes". Architects such as Thaddeus Whitely, Chief Designer with Hadyn H. Craigwell, Architect-Engineer of New York City, cited the "lack of esthetic qualities in much of the housing he had seen."

In spite of the fact that most tour members felt that the U. S. had the technical know-how, the resources, and the expertise, they recognized that there are a great number of constraints that must be overcome to industrialize the U. S. building industry and to permit minority builders to get a "piece of the action". Among the constraints they cited were labor unions, building codes, lack of a concentrated market, financing, zoning, and most important, the lack of any real government commitment on the scale that is necessary.

Edward Billingsley, Executive Director of the Community Renewal Foundation, Inc. of Chicago, and a member of the National Association of Non-Profit Housing Organizations, along with other community and civic organizations, says, "I think the limitations are solely unions and financing. If the unions do not come up with additional craftmen or come up with a program to produce housing a lot faster than it has been, then the federal government will be able to say that the present situation is not meeting the market demand and we are going to have to seek other means such as mass production geared to industrialized housing. I think minority groups in America would be the first organizations to begin this process."

Herman Russell, a local contractor and President of H. J. Russell Plastering Co., of

Atlanta, indicated some of the constraints in his area. "The difference between our systems and the European systems is that we are not allowed to prefab our interior partitions for the simple reasons of organized labor and the local building codes."

Another tour member, Johnny Johnson, Director of the Model Cities Program in Atlanta, felt that unions are "primarily a political constraint that had to be dealt with." He looked to the government's "Operation Breakthrough" program to help remove this barrier. "Somehow we are going to have to lock ourselves into that operation," he said.

Other tour members felt that unions will eventually respond. "I think we can work with the unions if we can get them to back us in the financing," says Waldo Bethel of the General and Specialty Contractor Association, San Francisco, Albert Samson, who is Housing Director for the Southern Christian Leadership Conference, says, "I think if the building trade unions were smart and if they had the organizational maturity, they would marry low-income people, unskilled labor, and minority groups to launch a mass movement against the big corporations that are seeking to control industrialized building in the U. S."

Most of the tour members agreed that government commitment was the key to overcoming many of the constraints. "I see a lack of our central government's fundamental commitment to do whatever is necessary to make it all work. I look at the Greater London Council and their development of Thamesmead. This body has planning powers, but, in addition, it has the power of eminent domain. I look at La Defense and see the French government creating an urban development project of the largest scope. I look at the Netherlands, for example, where the government subsidized 80% of all housing," says Glenn Claytor, Director of Housing for the National Urban League.

He went on to say that minorities must take two approaches to overcome these constraints against industrialized building and to insure minority groups getting a "piece of the action." "First we must exert pressure to get the national commitment in terms of priorities and second, we must make the maximum use of federal legislation. The issue of housing should be nonpartisan," he said.

His view was shared by Cornelius Cummings, who said, "There has to be government participation to help us break down the restrictions in towns, villages, and other areas where many local governments are opposed to the mass production of housing."

In exploring the possibilities for licensing, joint venturing, and other opportunities for minority participation in industrialized housing operation, a number of members felt that many European systems builders are looking to the U. S. housing market and would be receptive to minority groups, if they have the necessary financial and business criteria. However, participants pointed out that minority groups must pool their expertise and consolidate their power base to provide the protection the European system builders are seeking.

"My personal investigation and private discussion with many executives of the European systems companies show that they are receptive to black minority groups but are limited in their approach. We have had offers of 30% interest in ownership by some companies and up to 50% or 60% required by others. There are some that are even willing to go 50-50 on the financing, while others would be willing to let us set the terms," indicated Cornelius Cummings.

Johnny Johnson said, "It will require assembling new consortiums among ourselves and working together if we, as minorities, are going to break into the market. His view was amplified by Stan Sumlin, Co-Director of the Black Economic Research Center. "We have to come up with a solid comprehensive package, which would not only indicate the market, but mobilize the financial links and show them there would be a definite advantage to join with minority groups." William Ross, Acting Director of the Contract Compliance and Employment at the U. S. Department of Housing and Urban Development, also indicated that European system builders are looking for highly sophisticated organizations to make inroads in the U. S. But he emphasized that federal legislation already requires that, to a maximum feasible degree, business relationships in housing must involve minorities.

Other tour members pointed out that, as a result of the tour, European systems builders are now aware that minority groups in the U. S. demand a part in any system building operation here. Joyce Whitley, City Planner and Partner in Whitley & Whitley, Architects and Planners, of Cleveland, Ohio, said, "The systems people have been made aware that the minority communities in the U. S. want to be protected and won't let people in unless we have a piece of the pie."

Ed Billingsley agreed with this view, saying, "I think if European companies are smart enough they will seek to tie in with the kind of institutions that sponsored this tour and who could possibly generate political power for protection. I would assume that minorities in America will simply control their communities and stop all outside organizations from coming in to build housing."

Representing a wide variety of community organizations, tour members were especially concerned with user reaction in their localities. Most leaders felt that the system would have to be modified to meet American life styles, but that the method of construction proved no real barrier. Of particular concern were safety features, interior finishings, room sizes, plumbing and electrical systems, and the esthetics of the building systems they had seen.

"I was impressed by the flimsiness of the interior design and the lack of safety features," commented Syd Finley, an NAACP Field Director in the Chicago area. Napolean Johnson of the National Urban League warned, "We must make sure that the people who are packaging these systems are concerned with design and esthetic value." His view was shared by Ed Billingsley, who says, "I don't think that Americans, even low-income Americans, like housing that looks primarily like public housing. We need more variety. A person likes to have individual personality in his dwelling and you have to sacrifice something to go into mass production. However, our needs are so critical that we must worry first about increasing production."

Most tour members feel there would be no problems, if the housing was attractive and fit the living styles in their communities. "Since system building is a method of construction, I believe it would be accepted by the people in the community provided all the other accustomed features are there," says architect-engineer Hadyn Craigwell.

Community leaders were also concerned with the social aspects. Irene Smith, National Vice President of the NAACP and Business Manager of the New Jersey Fonger Co-Op Association, says, "I was quite impressed with the concept and find it adaptable to our needs. We must redirect our energies and use a plan similar to the Marshall Plan that used U. S. money to rebuild Europe after World War II. We not only have to change the way houses are built, but we must change the minds of people to deal with the social aspects of housing and to start subsidizing decent living conditions for all Americans."

Hal Graves, Director of the Division of Building Science at Pratt Institute, New York, commented, "It is not really the systems, but the planning and the involvement of people with all its sociological implications that will determine user acceptance."

Maurice Brooks, Research Behavior Scientist with Batelle Memorial Institute, criticized the many high-rise structures that were seen on the tour. "I certainly see it as a problem we now have in public housing. When you put children who are young and in need of easy and quick access to play areas on the 10th and 14th floors, you put a constraint on their development. Of course, you pay for this mishousing in increased maintenance costs due to vandalism and destruction. So any one involved in industrialized housing in a region would have to develop dwelling units for the various life styles of the population and do the necessary behavioral research to determine the need and, based on this, develop a line of products."

Brooks also says, "The real key to the entire industrialized housing process in the U. S. is the people of the community that this housing is going to be for. It won't work unless they feel they have a proprietary interest in that housing and the development of land on which it is built. It is absolutely imperative that the community residents be brought into the mechanism and the proprietorship of whatever kind of licensing procedure or production mechanism that is installed in the communities. If system builders do not do this, they will run into economic disaster in minority communities."

In commenting on other aspects of the tour, participants cited the extensive planning and development that goes into developing housing for European new towns. Rebecca Williams said, "The planning in England's new towns and in Stockholm has far surpassed any other country. We also do a lot of planning but it always ends up on the library shelf. The Swedes really understand planning. They do it, then put it up for everyone to see. This is the only way we can create the environment we are talking about."

Emma McFarlin, Community Development Specialist with HUD in the San Francisco regional office perhaps summed up the tour member reaction to what they had seen. "I have seen the implementation of technology that already exists and its application to housing. All we need now is the will to use it in the U. S."

Founding of the Institute of Industrialized Building Opportunities

Upon completion of the tour, members felt that minority groups should cooperate in launching opportunities to get involved in system building in the U. S. and to create new business opportunities throughout the country. In view of projected American activity in the field of industrialized building, The Institute of Industrialized Building Opportunities (IIBO) was formed. It will act as a clearing house and conduit through which various minority members of the housing production process can keep in touch and discover new resources for such teamwork.

The goals and objections of IIBO are:

(1) To establish production of industrialized building among minority entrepreneurs.

(2) To insure that minority consumers will be able to participate in the marketing of all building systems which will be offered to them.

(3) To establish a clearing house capable of providing evaluations of building systems, new processes, new materials and components.

Executive offices have been set up in Boston at the headquarters of the Positive Program for Boston. It is hoped that the Institute will acquire funds for at least one year's operation during which time it would be fully organized. IIBO plans (1) to disseminate housing information, (2) to set up at least six business venture groups in different areas of the country, and (3) to conduct seminars and conferences in cities which contain potential developments. The business groups would negotiate the building of industrialized housing plants, capable of constructing housing units. IIBO would handle any nonprofit activities while other services for profit would be handled by an IIBO development group.

The founders of IIBO recognized from their European tour of industrialized housing plants and research centers that up-to-date technical information is a basic necessity in evaluating systems building opportunities. IIBO has been working with the Battelle Memorial Institute of Columbus, Ohio, in technical information and groundwork activities.

IIBO members come from a wide variety of minority housing and housing-related interest groups. Among the groups represented are: NAACP, National Association of Black Consultants and Urbanologists, National Association of Nonprofit Housing Organizations, National Association of Real Estate Brokers, National Bankers Association, National Business League, National Housing Producers Association, National Insurance Association, National Urban League, Inc., Southern Christian Leadership Conference, National Technical Association of Minority Contractors, and National Association of Afro-American Builders. Other groups, such as American Institute of Architects, the Associated General Contractors, IBEC, the National Bureau of Standards, Battelle Memorial Institute, Department of Housing and Urban Development's Office of Equal Opportunity and Office of Research and Technology and U. S. Civil Rights Commission, have shown interest.

Already IIBO has sought involvement in demonstration projects to be built in three different areas of the country. The units are to be constructed by systems building companies which have either joint ventures with minorities or are wholly owned by minorities. With these projects, IIBO expects to demonstrate that minorities are capable of planning, producing, and constructing developments which not only improve the environment and living standards of people, but also demonstrate potential economic development for an industry which has denied minority participation since its start in this country.

Currently, three sites are being investigated on which prototype housing could be constructed: Hollywood, Fla., Gary, Ind., and Tucson, Ariz. The sites are in regions with differing climates, differing minority racial groups and a mix of income levels.

A nonprofit, incorporated association of Minority Housing Interest Groups will be formed to handle the demonstration projects. The Department of Housing and Urban Development's (HUD) Office of Research and Technology has agreed to assign technical liaison personnel and assistance in expediting program processing for specific projects. However, the projects will not be included in "Operation Breakthrough" and will not be funded by HUD. At present the Minority Housing Interest Groups are working with a planning team from Stockholm, Avanova, Inc., in evaluating systems to be used. They also are seeking local sponsors for demonstration projects.

■ Appendix A

Adaptability of European Systems to the U. S. Market

By John Coke*

Technical Advisor to NAACP European
Industrialized Housing Tour.

The goal of the tour was to seek knowledge of European systems building techniques and to determine whether these techniques could be used to help solve the problems of housing procurement and production by minority groups in the U. S.

Generally, a central plant operation requires substantially more capitalization than an on-site operation. Estimates ranged from $1.5 million to $5 million for central plants, including inventory and equipment. On-site capitalization costs normally ranged from $75,000 to $500,000, depending on sophistication of equipment.

It was obvious to some contractors on the tour that European estimates of capital needed to establish systems plants in the United States could be far from the mark, because of the difference in quality between United States equipment and European equipment, which also affects the differences in worker efficiency between the five countries. The choice between an on-site or central plant in the U. S. depends upon the frequency and magnitude of classic constraints to systems building and upon market aggregation. European governments often aggregate the market and offer interest subsidies to companies investing in central plants.

With the obvious variation of quality, amount, type, and consistency of demand between European countries and the even greater difference between a substantially consumer-oriented U. S. market and a government-dictated European market, European systems might have to be modified before they can be used in the United States.

Market aggregation and strategy therefore loom as the overriding consideration. The United States already possesses technical knowledge at least equal to or superior to Europe. Certain elements such as plant management and precasting techniques are lacking at this moment in the U. S. but such expertise can easily be imported.

The performance-oriented type GEAI system elicited interest not only because of the difference in material, steel frame instead of concrete panel, but also because of various implications in production economics spun off by the system. The system uses lightweight steel and other components which are predimensioned.

Tour members saw the possibility of creating a cadre of small businesses which would supply components to such a building manufacturer. Inherent pitfalls to such an arrangement, however, are the competitive bidding process and the potential for price collusion among subcontractors. The somewhat stark appearance generated by the steel frame and curtain wall design could also present a consumer-acceptance problem in urban U. S. areas.

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* John Coke is Research Architect in the Construction Systems, Planning, and Economics Division, Department of Social and Management Systems at Battelle Memorial Institute, Columbus, Ohio and a registered architect.

No systems builder outside of Great Britain took into account user needs in his design or planning, because generally, the European market is not consumer oriented. In all the countries visited, high-rise, multi-family construction is decreasing, because of the adverse sociological conditions resulting from such planning. However, most European concrete panel systems are more economical in direct proportion to building height up to approximately 25 stories. There is no cost advantage over traditional methods when the building is under three stories. With the obvious future proliferation of low-rise, multi-family units in both the U. S. and Europe, the capitalization structure and technical specifications of a concrete building system must change so it can achieve a more "open" condition, allowing other components to "cross fertilize" it.

Many tour members from predominantly rural U. S. areas expressed the need for systems capable of economically manufacturing single-family houses, since almost all the concrete panel systems seen were suitable for high-rise buildings only (reminding Chicagoans of the terrible "projects" of the black ghetto). Two likely single-family systems were inspected in Sweden, one of panelized frame construction (BPA), and the other an innovative sectional house built of corrugated metal panels (RNK). Both appeared to be expensive for the space provided as compared with U. S. prices.

Questions were also raised about the capability of building systems to adequately give aesthetic variations to dense, new towns. The reported high construction cost of Thamesmead seems to have obscured its importance as a prototype. Nevertheless, most of the technical tour people were impressed with the aesthetic variations possible in systems building seen at Thamesmead. Possibly, there could have been more variety in the exterior materials such as seen in Swedish new town developments.

A striking point about Thamesmead was the inefficiency of the central concrete panel plant. The capacity far exceeded the rate of construction, and obviously, the delivery system was not effective, because the area around the factory was overstocked with parts and the casting apparatus was inefficiently used.

Generally, some of the systems examined (such as Skarne, Vaneg, RBM, and others) could be used to build structures other than houses. Because dimensional or modular coordination is practised in the Scandinavian and Low countries, components are interchangeable. Denmark has passed new legislation authorizing the adoption of national building regulations and denying the right to change any technical stipulations. Other structures, such as hospitals, schools and shopping centers, especially in Sweden, used post and beam versions of building systems which were precast by the same factories.

CONCLUSIONS

The varying capitalization requirements, franchise, and joint venture arrangements set down by European systems manufacturers call for careful analysis, selection, and modification if any of those systems are to be transplanted in any form to the United States. Minorities have especially to be aware of marketing strategy and aggregation before investing in foreign systems which do not meet U. S. requirements. For example, most of the sophisticated European concrete panel systems pride themselves in the integration of electrical and mechanical conduits in slabs, yet this very advantage can be negated by restrictive building codes and trade unions in certain U. S. urban areas.

Software (marketing, management, and planning) groundwork is urgently paramount if any system is to succeed in the United States. Tour members were not able to appreciate the difference between a "building system" and "systems building", the integration of planning, design, programming, manufacturing, site operations, scheduling, financing and management, except in cursory lectures at Wates and Balency in Milan. The concept of systems building has to be expanded in the United States (as a buffer against price competition from corporate giants, now entering the field) by establishing client conglomerates where designers, builders, manufacturers, and subcontractors are all one entity.

It was obvious that regardless of price competition from traditional building, the U. S. will have to adopt systems building to cope with present or future demand. The current shortage of skilled labor will become even more acute in the future.

Blacks and other minorities are already aware of the value of community participation and user-needs information in creating a well-planned and attractive environment. This design criteria is even more pressing now that the construction industry is on the threshold of industrialization.

Financial participation in the manufacturing process is not a problem. Many companies are willing to finance minority entrepreneurs if these individuals are ready, willing, and able to aggregate a market. But market aggregation is not simply a matter of counting black heads. Minorities are still consumers and will select the best product for the best price.

The lessons of the European tour are obvious. Certain dangers are hidden, such as haste for minorities to own factories before the marketing, management training, and other groundwork has been laid. Many large companies which have attempted systems building in the past in the U. S. have failed for the very same reasons, and many systems exist only on paper in Europe. Technology abounds, but without good management, one of the most important keys for success would be missing.

This very valuable tour has convinced blacks that their rightful share of the construction market will no longer be denied.

■ Appendix B

IMPACT OF INDUSTRIALIZED HOUSING ON LIFE STYLES OF INHABITANTS

by Maurice D. Brooks*

My purpose in taking this study tour was to determine the impact of the housing designs used in the industrialized building systems of Europe on the life-styles of the inhabitants.

At first glance, the housing units observed seemed to be very much in line with the observed life-style of the populace for which they were intended. However, investigation showed that the dwelling units were more reflective of geographic and economic constraints than they were of user-needs research efforts.

MILAN

The Balency system, first seen in Milan, Italy, is a prime example of the general type of system seen on the tour. The building observed was a 14-story structure varying from 36 to 72 apartments. The rooms are small by American standards, especially the kitchens, which are centrally located and not very well lighted. The flooring was marble tile. The heating system consisted of a warm water heat exchanger equipped with a fan to circulate warm air throughout the dwelling unit.

It appears that the room size conformed with the high density life style that has developed in European countries historically because of scarce land.

This maximum utilization of space appears to have been at least in part responsible for the lower space allocation per person than is customary in the United States.

In American society, especially black society, the center of the home activities is the kitchen. This is not the case in any of the countries visited on the tour. An example of the difference between the European and American life styles is clearly evident in the type and size of the refrigerators provided in the dwelling units. These refrigerators were normally three to four cubic feet as compared to the seven to eleven cubic feet refrigerators normally used by American families. The probable reason for this difference is that Americans tend to buy food on a weekly basis whereas Europeans tend to buy small quantities of food daily. This same difference in living habits is evident in the reduced range size and work space observed in the small kitchens. A similar phenomenon is exemplified by the paucity of cupboard space provided in the kitchens.

The reduced range size appears to be influenced by several characteristics. The rather simple dietary habits of the European worker do not require the use of the large array of utensils and burners that American housewives customarily use in preparing a family meal. Again, the reduced work space needs are probably reflective of the less elaborate meal preparation needs of the European housewife. The dim lighting provided in the kitchens must surely have aroused some complaints from the European housewife since these centrally located kitchens don't receive any direct and little indirect natural light. This, coupled with the lack of an outside view and relative isolation within the dwelling unit, would certainly be objectionable to most American housewives. The kitchen is generally the focal point of black family activities, therefore, the combination of the above mentioned differences would make this typical European kitchen wholly objectionable to black people in America.

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* Mr. Brooks is a research physicist and research behavioral scientist with Battelle Memorial Institute, Columbus, Ohio.

In other areas of difference, the line between economic restraint and recognition of the user needs is much less clear. For example, the apartments had a centrally located closet rather than closets in the bedrooms. This design obviously resulted in construction savings. While no objections were noted from Europeans, it would be difficult to imagine an American housewife putting up with such an arrangement.

The overall form and arrangement of the multiple dwelling structures presents another more generalized set of cultural differences. Historically, the high-density living in European countries has produced a sharp difference in the life styles between urban and rural Europeans much as found in the United States. However, here the similarity seems to end. Whereas in the United States, Chicago in particular, black people from the largely rural South reacted violently to being housed above the third floor level, their European counterparts appear to accept these accommodations more stoically. The more aggressive violence exhibited by black people forced to live in high-rise apartment dwellings seems to be only partly explained by cultural shock to their life style. This phenomenon is probably also due to transference of aggressions caused by other socio-economic pressures present in American society that contribute greatly to the growing dissatisfaction of black people with the amount of control they are able to exercise over their environmental conditions. This hypothesis suggests that a part of the transference of aggressions from the intangible hostile society toward destruction of real property, namely an aversive dwelling structure, might well be a predictable phenomenon.

AMSTERDAM

The housing systems seen in the Netherlands were very similar to those seen in Milan, at least from the point of view of the user. There was one significant difference, however. The dwelling units were the result of a great deal of input with regard to the user-needs.

The impressions received from conversations with Mrs. A. D. Moll, Head of the User-needs Division of the Bouwcentrum, indicate that great strides in the direction of meeting user-needs have been made. This willingness to search for new ways of doing things appears to be consistent with the general mood of the populace. There is a sense of pride and accomplishment manifested in the attitudes of the average citizen. This sense of pride surfaces easily when conversations turn in the directions of either the land reclaimed from the sea or the booming building industry that produces 300,000 dwelling units per year. The builders, as well as the man in the street, feel that the housing problem in the Netherlands will become nonexistent within this decade.

The dwelling units observed in the ERA system in Rotterdam used a steel core to form the interior surfaces of the ceiling and party walls. With this system the interior dividing walls were made movable to allow for changes in floor plan and space allocation. This system with its flexibility certainly goes a long way towards meeting the individual user needs. The other systems seen in the Netherlands differed technologically but appeared to fit the general pattern seen in the Balency system, at Milan.

LONDON

Mrs. Melisa Welles, of the embassy staff at London, arranged for me to talk with the available people in the forefront of the research on user needs in the housing area. Some of these persons were: John Bailey, Executive Editor, **The Architects' Journal;** Professor Noble, The Architects' Association; Mr. Whitfield Lewis, Chief Architect, Ministry of Housing and Local Government; Dr. Thomas H. Glair, Sociologist, The Polytechnic; Mr. A. W. Barr, Managing Director, The National Building Agency. The bulk of the material and press of time do not allow the inclusion of these documents in this report. However, the very serious nature of the racial unrest in England, and London especially, demands my attention. From the trends in the U. S., it is reasonable to predict that large scale racial disturbances will hit England, and especially London, within the next three years. There is a very large segment of British subjects, primarily black former colonials, which have been alienated from the dominant segment of the society. The lower class workers express extreme hostility towards "those immigrants" who possess British passports. The news media refers to them in the same derogatory manner. Jobs are very difficult to obtain and in spite of a universal rent subsidy plan, housing is virtually impossible to find outside of given areas. For example, no "immigrant" lived in any of the new towns such as Thamesmead which I visited. When I questioned those to whom I spoke about this problem area, the response was generally the same; understanding of the implications but no idea of how to find a solution. The head of the Institute of Housing Managers, the training ground for all housing managers, admitted that housing patterns were the topic of conversation whenever housing managers meet, but the institute does not have a course in race relations nor does it foresee one in the future. The race issues are just too expensive. Young black aspiring architects to whom I spoke while at the Architects Association, the leading school of Architecture in the world, were equally pessimistic concerning future unrest. They were generally bitter and frustrated by their first encounter with racism in their Mother-Country.

Thamesmead, mentioned earlier, is by far the most advanced concept of city planning seen on the tour. The architecture of the original structures is outstanding. There is complete segregation of motorist and pedestrian traffic; ample parking and shopping facilities are provided right in the total structural design, producing all in all, a very pleasing environment. Unfortunately, however, we were unable to see a completed dwelling unit since they were all occupied.

Therefore, I have no idea of how well they might suit the user. Studies I have received since my return lead me to believe that they are probably a little improvement over the normal offering. The sad part of this entire experience is that England seems to be headed down the same path to racial chaos due to its housing patterns that we in the U. S. have been traveling for years.

STOCKHOLM

In Stockholm, I spoke with Mr. Manfred Nillson, Head of the Labor Organization (national union) concerning that organization's efforts to meet the needs of the working class of people especially in the area of housing user-needs studies.

Dr. Iven Hesselgren, Lund University, talked with me concerning his research in the area of man-made environment and its affects on man's personality development. Dr. Hesselgren presented me with his previous 2-volume work **The Language of Architecture.** Since my return, I have received a draft copy of his manuscript for the new book, **Man's Perception of Man-Made Environment.**

Mr. A. D. Jerkedal, Executive Director, Personnel Administration, spoke with me concerning the role of this organization in meeting the needs of the Swedish workers. His organization serves a catalytic role through funded research in educational needs, retraining needs, psychological services, migration patterns, immigration patterns, etc. The role of the P. A. has been to work with government, labor organizations, and business unions to solve the problems common to all. The P. A. has the responsibility of solving the crises created by the industrial shutdown of a village. The P. A. is also often called upon by the various Labor Market Boards to provide assistance to them. The efforts of P. A. with respect to meeting the housing needs of the user were directed almost exclusively to utilization and allocation of space.

The highlight of the tour came as a result of an extremely enlightening evening spent with Prof. Gunnar Myrdal. His discourse on the problems caused and faced by the immigration of peoples of Turkish extraction was very incisive. A great deal of his remarks were directed at the development of the government and provided a great deal of information with regard to the attitudes of the Swedish people towards their governmental structure, their style of living, and their concept of the other nations of the world.

Sweden is second only to the U. S. in Gross National Product and enjoys a healthy economy. The rate of unemployment varies from 3.6 percent in the "Norrland" to 1.6 percent in the highly industrialized south. The national average of unemployment, as of February 1969, was 2.3 percent. In order to reduce the high unemployment rate in the Norrland, the Labor Organization, the Personnel Administration, and the National Labor Market Board have mounted a vast retraining-relocation program over the past twenty years. However, the success of this program has been marginal. The Norrlander (typically the forest people) are fiercely individualistic and have resisted urbanization fairly successfully over the years. The instruments used to screen the Norrlanders into the relocation training programs clearly indicate the unsuitability of these individuals to urban life and yet there are large sums of money still being spent in this effort. Typically, a graduate trainee will be located in southern Sweden, go to work in a factory at a job he has been trained for, and in a short time, a matter of two or three months, return to his beloved Norrland and the harsh, but free life, which was left behind. Over the years, some individuals have been forced through this cycle several times.

Little is being done, or can be done at this time, to ease the assimilation of the Mediterranean immigrants into the Swedish economic mainstream. The language problem is extremely severe and the educational level of the immigrants makes any sort of training virtually impossible. Coupled with these problems is the almost universal lack of skills needed in the highly technological country Sweden has become. It appears that the solution to this particular problem area is not in sight.

SUMMARY

In summary, the tour of industrialized building systems of Europe was a highly worthwhile endeavor. The particular interest in the area of user needs disclosed a large gap between the best efforts observed and the needs of the user. The development of communities and building systems of these types in the United States will require the services of behavioral scientists concerned with user needs if we are to be successful in avoiding aversive housing units and complexes. Where these needs were not being met, at least minimally, significant increases in maintenance costs were observed to result.

In the area of community service, cultural needs, and educational facilities, the Center of Education and Culture of the Valley of Yerres, France, is a unique example of successful planning and implementation in this area. It was well worth the expense to have the opportunity of observing this unique model.*

The approach to the problems faced by the government, labor unions, businesses, and workers of Sweden provided a practical demonstration of how these disparate groups can cooperate to solve their common problems with minimum discomfort to all concerned. The lone exception to this otherwise rational effort seems to be the attempt to urbanize the individualistic Norrlander.

The physical beauty of the building complex as well as the architectural style must be seen to be appreciated. An inkling of the care that went into planning the complex is the fact that none of the ancient Cedars of Lebanon on the original site were destroyed. The designers built the various buildings to take advantage of the beautiful mixture of the old and new at every instance. An example of this is the dining building which is built on pylons to give the diners the feeling of floating among the branches of the cedars that surround it. This dining hall has beauty in its function as well. It serves the students of the college (8 to 14 years old) during the day and in the evenings the young bachelors and bachelorettes of the town are able to enjoy a very reasonable and not so lonely evening meal. Another intangible beauty of the center is the way the elderly (referred to as the less young by the staff) are included in the center activities. As the Mayor said, "My greatest joy comes when I meet a 'grandmother' (elderly woman) on the street and ask her where she's going and she replies to the Center of Education and Culture." Although it is still incomplete, it appears that the Center has already become the center of the social activities of the Valley of Yerres.

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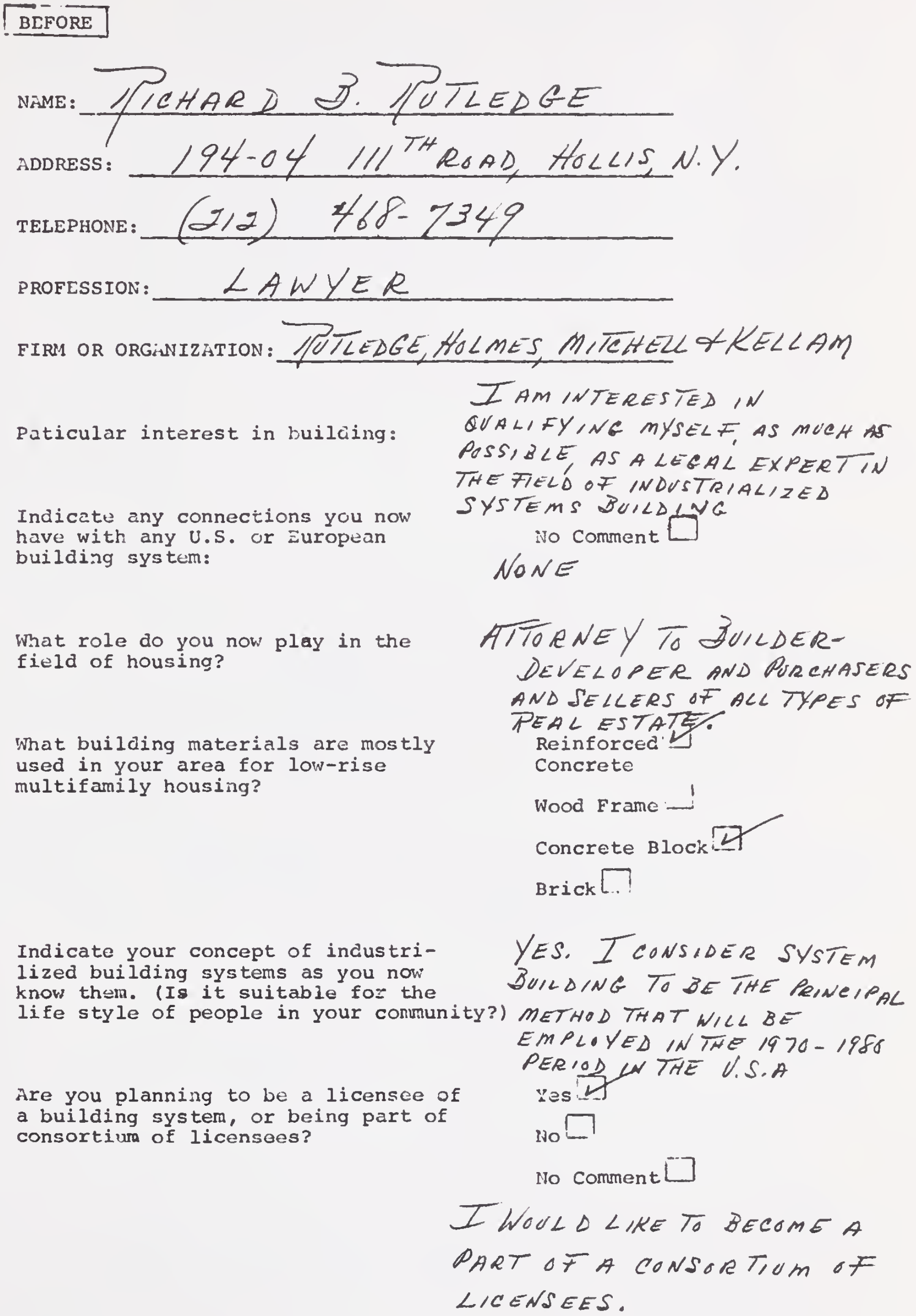
* Yerres Township is experimenting enthusiastically with a system of continuous education. Its Educational and Cultural Center is being built in the very center of the township. The novel educational institution serves people of all ages and comprises:

- A C.E.S. — 807 students for the year of 1969-1970, 5,000 student capacity.
- A Social Development Center
- A Sport Center
- A Youth Center, the "House for All"
- The Artistic Development Workshop (the Three A's)
- A Social Center with a children station
- A Library with visual aids and recordings.

■ Appendix C

Interest sheets — Before and After



BEFORE

NAME: RICHARD B. RUTLEDGE

ADDRESS: 194-04 111TH ROAD, HOLLIS, N.Y.

TELEPHONE: (212) 468-7349

PROFESSION: LAWYER

FIRM OR ORGANIZATION: RUTLEDGE, HOLMES, MITCHELL & KELLAM

Paticular interest in building:	I AM INTERESTED IN QUALIFYING MYSELF, AS MUCH AS POSSIBLE, AS A LEGAL EXPERT IN THE FIELD OF INDUSTRIALIZED SYSTEMS BUILDING
Indicate any connections you now have with any U.S. or European building system:	No Comment ☐ NONE
What role do you now play in the field of housing?	ATTORNEY TO BUILDER-DEVELOPER AND PURCHASERS AND SELLERS OF ALL TYPES OF REAL ESTATE.
What building materials are mostly used in your area for low-rise multifamily housing?	Reinforced Concrete ☑ Wood Frame ☐ Concrete Block ☑ Brick ☐
Indicate your concept of industrilized building systems as you now know them. (Is it suitable for the life style of people in your community?)	YES. I CONSIDER SYSTEM BUILDING TO BE THE PRINCIPAL METHOD THAT WILL BE EMPLOYED IN THE 1970 - 1980 PERIOD IN THE U.S.A
Are you planning to be a licensee of a building system, or being part of consortium of licensees?	Yes ☑ No ☐ No Comment ☐ I WOULD LIKE TO BECOME A PART OF A CONSORTIUM OF LICENSEES.

BEFORE

NAME: L. S. Gaillard

ADDRESS: #1 - Finley Ave. W. B'ham, Ala. 35204

TELEPHONE: 324-1654

PROFESSION: General Contractor & Master Plumber

FIRM OR ORGANIZATION: Gaillard Co. Inc.

Paticular interest in building:

Indicate any connections you now have with any U.S. or European building system: No Comment ☐ None

What role do you now play in the field of housing? Commercial only at Present None

What building materials are mostly used in your area for low-rise multifamily housing?

Reinforced Concrete ☐
Wood Frame ☐
Concrete Block ☑
Brick ☑

Indicate your concept of industrilized building systems as you now know them. (Is it suitable for the life style of people in your community?) Has a great potential Yes.

Are you planning to be a licensee of a building system, or being part of consortium of licensees?

Yes ☑
No ☐
No Comment ☐

AFTER

NAME: MARCUS H. RAY, JR. P.E. { F.W. EVERSLEY & CO., INC.
NEW YORK CITY }

Features that impressed you most in MILAN:

1) HIGH STANDARD OF WORKMANSHIP IN FACTORY-PRODUCED PANELS
2) TASK-BREAKDOWN ON JOB-SITE & ERECTION PLANNING -- JOB SITES LOOKED NEAT & WELL ORGANIZED
3) HIGH QUALITY OF INTERIOR FINISHES

AMSTERDAM:

1) THE COMPREHENSIVE REGIONAL & TOWN PLANNING FOR THE POLDERS
2) THE HIGH QUALITY & VARIETY OF EXTERNAL FINISHES
3) THE BAUCENTRUM -- THE CONCEPT OF A WELL-ORGANIZED INFORMATION CENTER FOR ALL PARTICIPANTS IN HOUSING ACTIVITIES
4) MOVING ASSEMBLY LINE PRODUCTION

PARIS:

1) COMPLETE SERVICE (TECH. IDEAS & PROJECT MGT.) OFFERED BY ENGINEERING FIRMS TO BUILDING CONTRACTORS FOR SYSTEMS BUILDINGS. THIS MIGHT SERVE AS A MODEL FOR BLACK ARCHITECTS & ENGRS IN THE U.S.A. -- SELLING TECH. EXPERTISE & MANAGEMENT

LONDON:

1) EFFECTIVE & WELL-PLANNED EXECUTION OF GOV'T POLICY (DECENTRALIZATON & MAINTENANCE OF LONDON'S GREEN BELT) -- BY INOVATIVE PRIVATE FIRMS
2) STRUCTURAL INTEGRITY OF SYSTEM'S BUILT HOUSING -- AS STRONG OR STRONGER THAN CONVENTIONAL TECHNIQUES

STOCKHOLM:

1) APPLICATION OF SYSTEMS BUILDING TO BOTH MULTI-FAMILY AND SINGLE-FAMILY HOUSING -- USE OF WOOD & METAL PREFAB IN ADDITION TO CONCRETE PANELS
2) SELF-CONTAINED COMMUNITIES W/ SHOPS & INDUSTRIES -- WITH GOOD RAPID TRANSIT CONNECTIONS TO STOCKHOLM

Do you think that people in your community would like to live in communties built by building systems?

ABSOLUTELY! IF ONLY WE CAN NEUTRALIZE PROPAGANDA GENERATED BY THE A.I.A. & ARCHITECTS IN GENERAL, THAT EVERY BUILDING MUST BE OF UNIQUE DESIGN

What role will you play in any building systems education or implementation in your community?

F.W. EVERSLEY & CO., WILL USE SYSTEMS TECHNIQUES IF:

a) ITS ECONOMIC FEASIBILITY CAN BE DEMONSTRATED IN NEW YORK CITY
b) OUR SPONSORS, UNIONS, ARCHITECTS CAN BE PERSUADED TO COOPERATE

Do you think that system built housing in Europe will have to be modified to fit the U.S. market? Please comment.

YES! CODE REQUIREMENTS -- ESPECIALLY FIRE & STRUCTURAL PROVISIONS MUST BE MET

Negative features you observed:

1) INSUFFICIENT STRUCTURAL RIGIDITY IN SOME CONCRETE PANEL SYSTEMS
2) NON-DURABLE INTERIOR FINISHES { ALTHOUGH THIS NEED NOT BE
3) LONG CONSTRUCTION TIMES A CHARACTERISTIC OF SYSTEMS CONST. }

Was your basic concept of building systems changed by the tour?

YES. I WAS SURPRISED TO LEARN HOW EACH SYSTEM COULD BE BROKEN DOWN INTO EASILY EXECUTED STEPS -- MANY OF WHICH CAN BE PERFORMED BY RELATIVELY UNSKILLED LABOR. THE BASIC TECHNICAL CONCEPTS ARE STRAIGHTFORWARD AND EASILY GRASPED BY PERSONNEL FAMILIAR WITH CONVENTIONAL BUILDING TECHNIQUES. GENERAL CONTRACTORS WILL NOT HAVE TO GO THROUGH AN EXPENSIVE "RE-EDUCATION" PROCESS TO USE SYST. TECHNIQUES.

AFTER

NAME: Hall H. Graves

Features that impressed you most in MILAN:
For better or worse, depending on your point of view they showed a more imaginative and greater variety in the use of finishing materials.

AMSTERDAM:
Automated assembly line and general efficiency of operation. Fine integration of high & low rise units plus housing for elderly.

PARIS:
Coignet system with its many years of development.

LONDON:
The philosophy of the "Waite" systems builder - that they were dealing with people not "blocks of concrete" - their extensive training program.

STOCKHOLM:
Craftsmanship of interior details. The elimination of slums by carefully planned socialized housing.

Do you think that people in your community would like to live in communties built by building systems? Its not really the system but the planning, the involvement of the people with all its sociological implications.

What role will you play in any building systems education or implementation in your community? I sincerely hope that the oppurtunity will present itself for my school to become involved in this and other forms of education for the community.

Do you think that system built housing in Europe will have to be modified to fit the U.S. market? Please comment. Certainly - modifications would even occur regionally in U.S. No problem - for example: compare characteristic shutters in Italy to wide open windows in holland or 1inch insulation in France to 4 inch insulation in Sweden.

Negative features you observed:

Was your basic concept of building systems changed by the tour?
No; I knew very little about it and had no preconceived concepts.

■ Definition of Terms

☐ **Systems (or industrialized) building:** The integration of planning, design, programming, manufacturing, site operations, scheduling, financing and management into a disciplined method of mechanized production of buildings.

☐ **Rationalized traditional system:** One that depends primarily on conventional skilled trades, but which incorporates mechanization and prefabricated components.

☐ **Building system:** The method by which a variety of structural and mechanical units are assembled, erected and installed to produce structures that will function for a specified use or combination of uses.

☐ **Open system:** One in which the components are interchangeable with those of other systems.

☐ **Closed system:** One in which the components are peculiar to that system and cannot be combined with those of another system.

☐ **Prefabrication:** Factory assembly of structural, mechanical or electrical components or complete and fully equipped structures, such as mobile homes.

☐ **Component:** A factory or site-produced unit designed to perform specified tasks.

☐ **Subsystem:** A group of factory or site-assembled components erected or installed in combination with each other to perform a specified task.

☐ **Dimensional (or modular) coordination:** Reduction of the sizes of all building components and buildings to multiples of one basic unit.

Book designed by Warren Marr, II